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REVISION OF THE COCKROACH GENUS *CTENONEURA* HANITSCH (BLATTARIA, POLYPHAGIDAE).

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Most of the 15 known species of *Ctenoneura* are redescribed and 12 new taxa are described. The genus is principally Malaysian, Indonesian, and Asian. A key is given to distinguish the adults.

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Key words. – *Ctenoneura*; Blattaria, Polyphagidae; cockroaches; taxonomy; new species.

There are 15 described species of *Ctenoneura* (Princis 1963: 101, 1971: 1138). I have seen the types of ten. I have not examined Bey-Bienko's species but have included his references and diagnostic features and included them in my key. Twelve new species are described.

The following museums and their curators or collection managers kindly loaned me specimens, or house types which I have not examined:

- EASC - Institute of Entomology, Academy of Science, China.
- HDEO - Hope Department of Entomology, University Museum, Oxford, England; Dr. George C. McGavin & Mr. I. Lansbury.
- MCZ - Museum of Comparative Zoology, Harvard University, Cambridge, MA, U.S.A.
- NRSS - Naturhistoriska Riksmuseet, Stockholm, Sweden; Dr. P. Inge Persson.
- RMNH - National Museum of Natural History (Rijksmuseum van Natuurlijke Historie), Leiden, The Netherlands; Mr. J. van Tol.
- ZILS - Zoological Institute, Lund, Sweden; Dr. Roy Danielsson.
- ZINR - Institute of Zoology, Academy of Science, Russia.

SYSTEMATIC PART

Genus *Ctenoneura* Hanitsch

Ctenoneura Hanitsch, 1925: 100; Princis (1953) 1954: 207-208 (key to species); 1963:101. – Type species: *Ctenoneura major* Hanitsch, selected by Princis 1950: 204.

Etymology. – The name refers to the comb-like arrangement of the cubitus branches on the hind wing (Hanitsch 1925: 100).

Diagnosis. – Head, pronotum and tegmina not pubescent. Tegmina and wings fully developed extending well beyond the end of the abdomen, the former horny, venation clearly defined, discoidal sectors usually oblique (fig. 4C), rarely longitudinal or curved anteriorly (figs. 1F, 2B). Hind wings completely overlapping each other; usually with (fig. 9c) an intercalary vein (rarely absent; fig. 1E) between the radial and branched media rami; cubitus vein with three to eight parallel, curved, comb-like branches (some of which may be forked) (figs. 1E, 9C), the anal area folded over the rest of the wing, but not fan-like. Anteroventral margin of front femur with a row of minute piliform spinules, terminating with a single large spine (Type C_1); pulvilli absent, tarsal claws symmetrical, usually simple, rarely serrated, arolia, if present, minute, fleshy, unsclerotized. Supraanal plate of both sexes transverse, short. Male: Abdominal terga appear to be unspecialized, but many species have a white, membranous area which could be a tergal gland on the supraanal plate (slides of the terminalia were not prepared). Subgenital plate usually strongly asymmetrical with modified hind margin (e.g., fig. 6B), rarely symmetrical, unmodified (fig. 1B); usually with only one style on the left side (e.g., fig. 5B), rarely with two (fig. 1B), or styles absent (fig. 14E). Female: subgenital plate valvular.

I did not study the male genitalia because for most of the species there were very few duplicate specimens to prepare slides. One of the most diagnostic characters is the shape of the male's subgenital plate and this structure is so convex that it is greatly distorted when flattened on a slide. Polyphagid genitalia are much more complex structures than those of Blattellidae and Blaberidae, and possibly might not show specific differences. I did not think it worth mutilating unique specimens for this purpose.

Distribution checklist by species of *Ctenoneura*

aberrans Hanitsch: Mentawai; Sumatra 86
acuticerca Bey-Bienko: China 87
annulicornis Princis: Borneo 88
biguttata Hanitsch: Sumatra 90
birmanica Princis: Burma 91
brunnea Hanitsch: Sumatra 92
crassistyla sp. n.: Pahang 107
fulva Hanitsch: Sarawak 94
gigantea sp. n.: Perak ... .87
hanitschi Princis: Sumatra 96
kemneri Princis: Java ... .92
kinabaluana sp. n.: Sabah 104
luma sp. n.: Perak 101
major Hanitsch: Sarawak 96
misera Bey-Bienko: China 92
mjoebergi Princis: Kalimantan; Sarawak 97
murudensis sp. n.: Sarawak 106
parascutica sp. n.: Sabah 103
poringa sp. n.: Sabah................100
propannulicornis sp. n.: Sabah 89
scutica sp. n.: Sabah 102
simulans Bey-Bienko: China 107
sp.: South Vietnam 107
spinastyla sp. n.: Sumatra 98
triprocessa sp. n.: Sabah 106
tuberculata Princis: Sumatra 97
uncata sp. n.: Sabah 99
yunnanea Bey-Bienko: China 94

Geographical distribution checklist of *Ctenoneura* species

Borneo (Kalimantan; Sabah; Sarawak): *annulicornis*; *fulva*; *kinabaluana*; *major*; *mjoebergi*; *murudensis*; *parascutica*; *poringa*; *propannulicornis*; *scutica*; *triprocessa; uncata*
Burma: *birmanica*
China: *acuticerca*; *misera*; *simulans*; *yunnanea*
Java: *kemneri*
Malay Peninsula (Pahang; Perak): *crassistyla*; *gigantea*; *luma*; *spinastyla*
Mentawai I.: *aberrans*
Sumatra: *aberrans*; *biguttata*; *brunnea*; *hanitschi*; *tuberculata*
South Viernam: sp.

Key to species of *Ctenoneura*

1. Hind wing without a intercalary vein (figs. 1E, 2C). Arolia absent 2
– Hind wing with an intercalary vein (fig. 9C). Arolia minute or absent. Male subgenital plate asymmetrical 4
2(1). Tarsal claws serrated. Cubitus vein of hind wing with three branches (fig. 1E). (male & female). Male subgenital plate symmetrical with two similar styles (fig. 1B) ....*aberrans*
– Tarsal claws simple. Cubitus vein of hind wing with four to six branches (figs. 2C, 2D) 3
3(2). Pronotal disk reddish brown, lateral zones darker brown, the edges yellow (fig. 2A). (sex unknown) ....*gigantea*
– Pronotal disk yellowish brown, lateral regions yellow-hyaline. (male) ....*acuticerca*
4(1). Subgenital plate with a setal tuft on the left posterolateral corner (figs. 3A, 3C) 5
– Subgenital plate without a setal tuft on the left posterolateral corner 6
5(4). Hind margin of subgenital plate with two U-shaped excavations on the right side (fig. 3A). Antennae with first four segments brown, succeeded by three whitish antennomeres, remaining segments brown. (male) ... .*annulicornis*
– Hind margin of subgenital plate unmodified on the right side (fig. 3C). Antennae dark brown, distal end with three white antennomeres succeeded by four dark terminal segments. (male) ....*propannulicornis*
6(4). Subgenital plate hind margin deeply excised, with a large, round swelling on the left side (figs. 12A, 12B; 13A, 13D) 7
– Subgenital plate hind margin excised or not, without a round swelling on the left side ..8
7(6). Left style small, arising near the apex of the left lobe of the subgenital plate, apexes of both lobes not setose (fig. 12B). (male) ....*tuberculata*
– Left style elongate, spine-like, arising near the base of the left lobe of the subgenital plate, apexes of both lobes setose (figs. 13A-D). (male) ....*spinastyla*
8(6) Pronotum shining black medially, dark reddish brown laterally, and with a pair of orangish maculae on either side of the anterior margin (fig. 4A). Right of subgenital plate with a pair of curved, spine-like processes directed towards the left (figs. 4B, 4E). (male) ....*biguttata*
– Pronotum and subgenital plate not as above. 9
9(8). Hind margin of subgenital plate not excavated, with an elongate process on the right side; style, if present, not visible from below or the rear (figs. 21E, 21F). (male) ....*simulans*

– Hind margin of subgenital plate excavated, left style, if present, visibile from below or the rear 10

10(9). Left side of subgenital plate with a hook-like structure, style absent (figs. 14C-14E). Antennae with four brown basal segments succeeded by yellowish antennomeres to about the middle, those on the distal half brown with some white terminal or preterminal ones. (male) ....*uncata*

– Subgenital plate without a hook-like structure on the left side, style present. Antennae not as above 11

11 (10). Subgenital plate with a long, slender process on the left side, its apex directed towards the right, bearing a small cylindrical style near its middle (figs. 11B-11D). (male) .....*mjoebergi*

– Subgenital plate not as above 12

12 (11). Hind margin of subgenital plate widely excavated, with a colourless, membranous area bearing a small, cylindrical style on its basal end (figs. 15A-15C). (male) ....*poringa*

– Hind margin of subgenital plate not as above 13

13 (12). Hind margin of the subgenital plate divided principally into two or three, dissimilar lobes, with a small cylindrical style arising on the left lobe near its middle, or posterolateral corner, or on the inner margin of the excavation 14

– Hind margin of the subgenital plate not as above 22

14 (13). Hind margin of subgenital plate with a deep V-shaped excavation, with a slender style on the left side; a slender, thorn-like filament is located on the dorsal surface of the plate, protrudes beyond the apical margin of the right lobe (figs. 15E-15G). Supraanal plate trigonal (fig. 15D). (male) ....*luma*

– Subgenital and supraanal plates not as above 15

15 (14). Subgenital plate with two overlapping lobes on the right side, the dorsal one upturned and partially covering the right side of the supraanal plate, the ventral lobe with minute spicules near its distal margin (figs. 5B, 5C). (male) ....*birmanica*

– Subgenital plate not as above 16

16 (15). Left lobe of the subgenital plate much narrower than the right one, the style originating on the posterolateral corner (fig. 5E). (male) ....*misera*

– Hind margin of subgenital plate not as above 17

17 (16). Hind margin of subgenital plate with a pair of narrowly separated lobes directed posteriorly, a style originating near the middle of the left one (figs. 8B-8D). Arolia absent. (male) ....*fulva*

– Hind margin of subgenital plate not as above. Arolia minute 18

18 (17). Style on the left lobe of the subgenital plate originating along the inner margin of the excavation (fig. 6B). (male) ....*brunnea*

– Style originating near the posterolateral corner of the left lobe 19

19 (18). Hind margin of the subgenital plate with a small process that curves dorso-sinistrad (fig. 10B-10D). Pronotum subrectangular, the disk with a sublozenge-shaped reddish brown macula narrowly margined with yellow, broad lateral zones yellow-hyaline (fig. 10A). (male). ....*hanitschi*

– Subgenital plate and pronotum not as above 20

20 (19). Right lobe of subgenital plate narrow, elongate, extending well beyond hind margin of the shorter, wider left lobe (figs. 9D, 9E). Pronotum suborbicular, reddish brown (fig. 9A). Cubitus of hind wing with eight branches (fig. 9C) ....*major*

– Right and left lobes of subgenital plate not as above (figs. 7C, 7F) ....:.......................21

21(20). Pronotal edging yellow, disk reddish brown, lateral regions brown-hyaline. Cerci brown. (male) ....*kemneri*

– Pronotal disk brownish black, lateral regions yellow. Cerci yellow. (male) ....*yunnanea*

22(13). Subgenital plate trigonal, hind margin with three slender processes that are curved dorsad, and a long tapering filament that protrudes between the left and middle processes; style absent (figs. 19A-19E). Cubitus vein of hind wing with three branches (fig. 19F) ....*triprocessa*

– Subgenital plate not as above. Style present. Cubitus vein of hind wing with more than three branches. Style present 23

23(22). Subgenital plate with a broad plate whose distal margin is excavated and upturned; left style is located in a pale, membranous area (figs. 20A-20E). Cubitus vein of hind wing with eight branches. (male) ....*murudensis*

– Subgenital plate not as above. Cubitus vein of hind wing with less than eight branches 24

24 (23). Hind margin of subgenital plate deeply excavated with a very large, stout style in the left corner (figs. 21A-21C). (male) ......*crassistyla*

– Subgenital plate and left style not as above 25

25 (24). Subgenital plate broadly excavated, with a short, broad, process without close lobes on either side, that extends dorsad, its distal end curving anteriorly towards the supraanal plate (figs. 18A-18D). (male) ....*kinabaluana*

– Subgenital plate narrowly divided medially, with a dark spine-like process that curves dorsad between the two lobes 26

26 (25). Margins of the excision smooth, practically touching the spine-like process (figs. 16A-16C). (male) ....*scutica*

– Margins of the excision are irregular and on the left side the region is unsclerotized (fig. 17B). (male)...............................*parascutica*

Redescriptions, and descriptions of new species

Ctenoneura aberrans Hanitsch
(fig. 1)

Ctenoneura aberrans Hanitsch, 1928: 37, pl. 2 figs. 8,9 (♀); 1929a: 294, Bruijning 1948: 41, 148, fig. 54; Princis, 1963: 101.

Material examined. – Holotype, (♀), Mentawe[a]i, Siberut, no. 91, 23.ix.1924, H. H. Karny; Type Orth. $342^1/_2$, in HDEO. – Paratype. Mentawai. HDEO: same locality and collection data as holotype, 1♂ (reported as 'sex ?'), no. 80, 22.ix.1924, Type Orth. $342^2/_2$. – SUMATRA. HDEO: Wai Lima, 1♂, 1♀, 2 (abdomens missing).

Redescription. – Female: Head covered, interocular space distinctly wider than the distance between antennal sockets. Pronotum with lateral and anterior margins convex, hind margin straight (fig. 1A). Tegmina and wings extending beyond end of abdomen, the former with a few well marked raised veins, few almost longitudinal veins in discoidal sector (fig. 1F). Hind wings broad, mediastinal vein straight, simple, radial vein slightly sinuous, costals not distinguishable; media vein, simple, cubitus vein with three curved parallel branches; intercalary vein (between the radial and media veins) absent (fig. 1E). Front femur Type C_1; pulvilli and arolia absent, tarsal claws symmetrical, distinctly serrated. Supraanal plate trigonal, apex broadly rounded (fig. 1D). Subgenital plate trigonal, valvular, completely hidden under the supraanal plate.

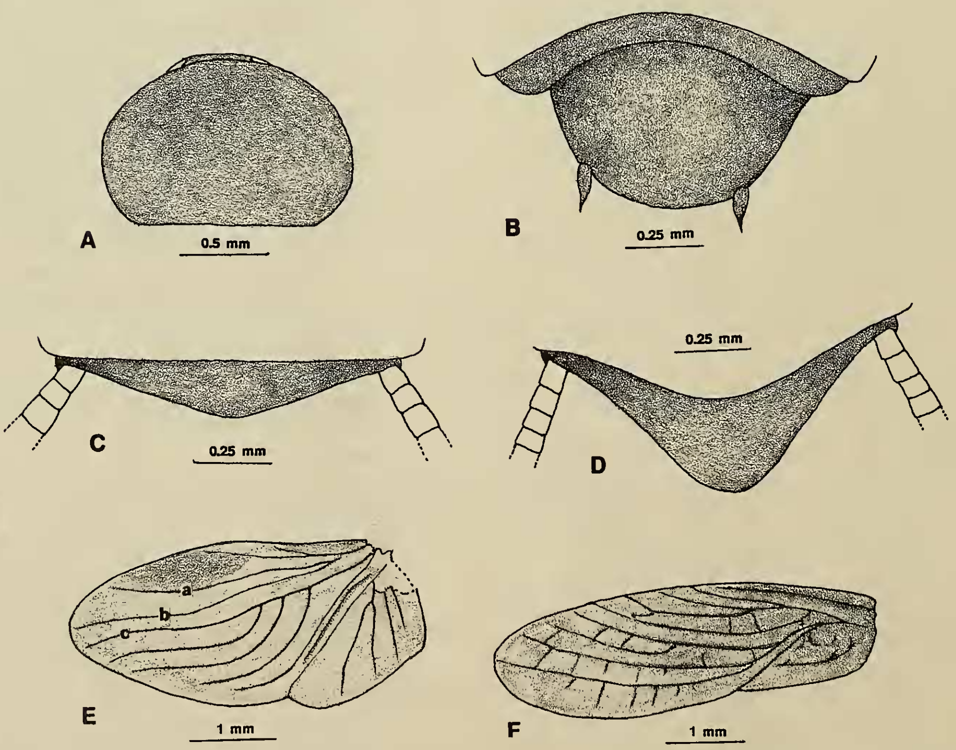


Fig. 1. *Ctenoneura aberrans* Hanitsch. – A. female (holotype) pronotum; B, C. male (paratype) subgenital (ventral) and supraanal (dorsal) plates, respectively; D-F. female holotype: D. supraanal plate (dorsal); E, F. hind wing and tegmen respectively (a = radius; b = media; c = cubitus).

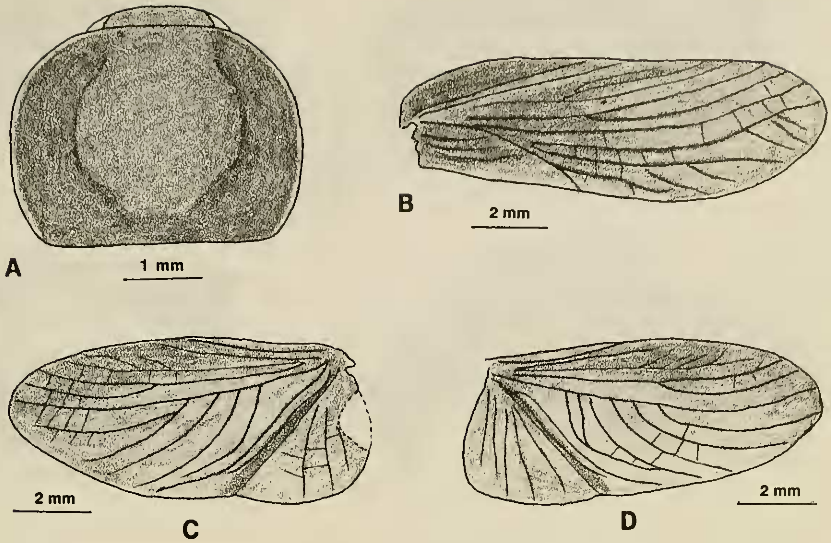


Fig. 2. *Ctenoneura gigantea* sp. n., holotype. – A. pronotum; B. right tegmen; C, D. left and right wings.

Male (previously undescribed): Differs from the female as follows: Supraanal plate transverse, very short, shallowly trigonal, apex rounded (fig. 1C). Subgenital plate essentially symmetrical, with two widely separated, similar styles, interstylar margin unmodified, convexly rounded (fig. 1B).

Colour. – Head dark chestnut brown, shiny; antennae relatively pale with yellowish tinge. Pronotum reddish brown throughout (fig. 1A). Tegmina hyaline amber, humeral and part of costal vein regions darker (fig. 1F). Wings with a dark blotch in the costal vein region (fig. 1E). Abdomen dark brown. Cerci brown. Legs pale testaceous.

Measurements (mm) (♀ in parentheses). – Length, 3.8-4.3 (3.6-4.0); pronotum length x width,, 1.1-1.3 x 1.5-1.8 (1.1-1.3 x 1.7-1.8); tegmen length, 4.0-4.5 (4.2-4.6); interocular space, 0.8 (0.8).

Comments. – This is the smallest species in the genus and is also unique in having a symmetrical subgenital plate with two styles, and serrated tarsal claws.

Ctenoneura acuticerca Bey-Bienko

Ctenoneura acuticerca Bey-Bienko, 1957: 896, 903, 912 (type ♀, Mt. Santaishan, Yunnan, China; in EASC) [not examined] (Russian, English summary); Princis 1963: 101.

Description (from Bey-Bienko). – Female: Pronotum smooth. Tegmina with five oblique branches of the radius which run into the median third of the costal margin, anal veins not quite distinct. Radius of hind wings with three slightly pronounced oblique branches, intercalary vein absent between radius and media, cubitus divided into six branches. Arolia absent. Supraanal plate large, triangular, apex emarginate. Subgenital plate with valvular part lozenge shaped. Apex of cerci with a large spine.

Colour. – Brownish yellow, pronotal disk yellowish brown, lateral parts yellow, transparant. Wings with distal part yellowish. Legs yellow. Cerci brownish yellow.

Male: Unknown.

Measurements (mm). – Body length, 8.5-8.7; pronotum length, 2.7; tegmen length, 10.2-10.5.

Comments. – According to Bey-Bienko, this species is related to *aberrans* (probably because of the absence of an intercalary vein, and arolia).

Ctenoneura gigantea sp. n.
(fig. 2)

Type material. – Holotype, sex unknown (abdomen missing), Gunung Kledang, Perak, 2646', xi.1916 (with a handwritten label, *C. pauciramosa...*, ms. name); in RMNH.

Description. – Sex unknown: Head exposed, interocular space greater than the distance between ocellar spots and antennal sockets. Pronotum parabolic (fig. 2A). Tegmina and wings fully developed, the former with raised veins, and longitudinal discoidal sectors (fig. 2B). Hind wing with about three poorly defined costal veins, intercalary vein absent, media vein with one branch, cubitus vein with four branches (one forked near the base on the left wing), and six branches (two of them joined distad on the right wing) (figs.

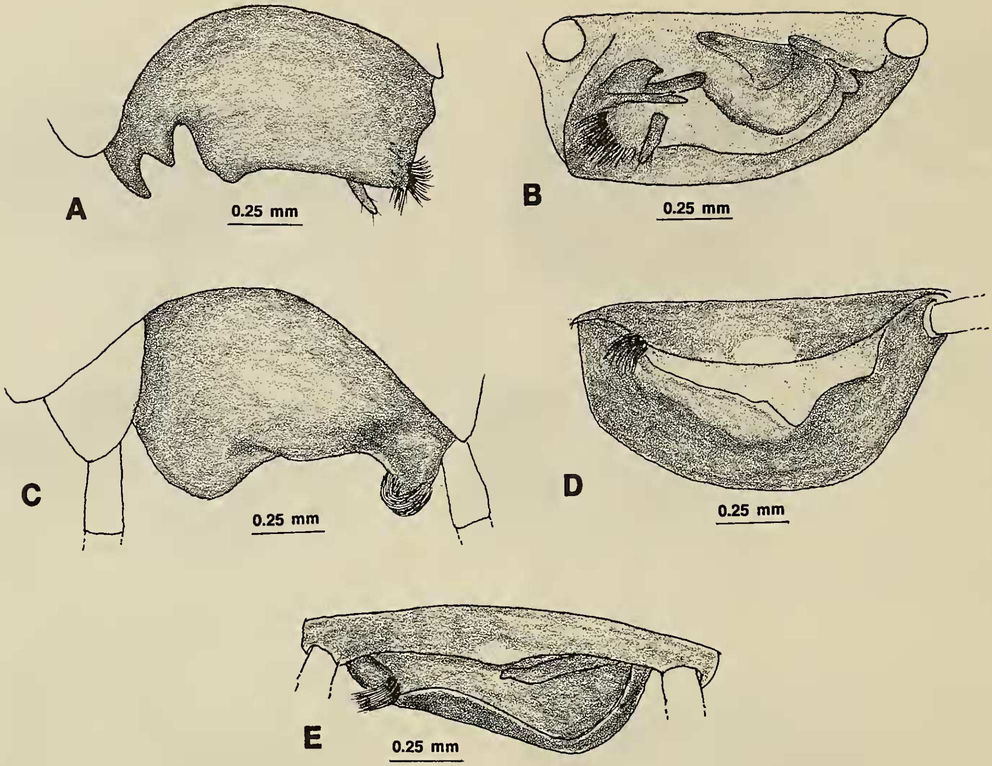


Fig. 3. *Ctenoneura* spp. – A-B, *C. annulicornis* Princis, male holotype, A. subgenital plate (ventral); B. subgenital plate (rear view); C-E. *C. propannulicornis* sp. n., male holotype: C. subgenital plate (ventral); D. supraanal and subgenital plates (rear view); E. supraanal and subgenital plates (dorsal; the distal region of the supraanal plate is deflexed and the margin is distorted)

2C, D). Front femur Type C_1; pulvilli absent, tarsal claws very long, simple symmetrical, arolia absent. Abdomen missing.

Colour. Head reddish brown, the region from the occiput to ocellar spots darker; antennae blackish. Pronotal disk reddish brown, lateral zones darker brown, lateral edges yellowish (fig. 2A).

Measurements (mm). – Length, ?; pronotum length x width, 2.9 x 3.7; tegmen length, 10.4; interocular space, 1.3.

Etymology. – The specific name refers to the large size of the species.

Comments. – I am describing this species even though its abdomen is missing, because its size is so much greater than any of the known species. Also the parabolic shape of the pronotum, the absence of an intercalary vein on the hind wing (known only in *aberrans* and *acuticerca*), and the complete absence of arolia, are good distinctive characters when coupled with its size.

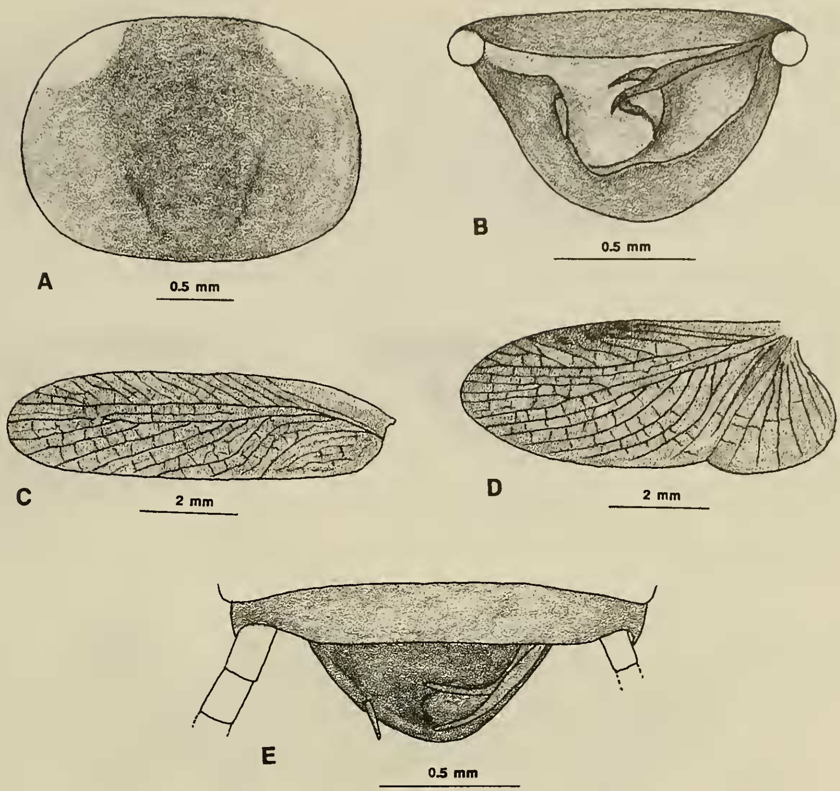
Ctenoneura annulicornis Princis
(figs. 3A-B)

Ctenoneura annulicornis Princis, (1953) 1954; 206, fig. 3. Holotype, ♂, Borneo, Long Navang, Mjöberg (NRSS) [examined]; Princis 1963: 102.

Ctenoneura fulva (nec Hanitsch, 1925); Hanitsch 1933: 235 [in part; only the Long Navang ♂]; Princis 1963:102.

Redescription. – Male: Head hidden, interocular space greater than the distance between ocellar spots and antennal sockets. Pronotum suboval. Tegmina and wings extending well beyond end of abdomen. Tegminal veins not raised. Hind wing with intercalary vein, media vein with one forked branch, cubitus with six branches. Front femur Type C_1; pulvilli and arolia absent, tarsal claws symmetrical, simple. Abdominal terga unspecialized. Supraanal plate transverse, narrow, symmetrical. Subgenital plate asymmetrical with a setal tuft on the left posterolateral corner, and with three sclerotized structures and a

Fig. 4. *Ctenoneura biguttata* Hanitsch, male holotype. – A. pronotum; B. supraanal and subgenital plates (rear view); C, D. left tegmen and hind wing; E. supraanal and subgenital plates (dorsal).



well developed cylindrical style, also on the left side, the right side with a pair of U-shaped excavations (figs. 3A, B).

Colour. – Head dark reddish brown; antennae with first four segments brown, succeeded by three whitish antennomeres, remaining segments brown. Pronotal disk dark reddish brown, lateral zones hyaline. Tegmina hyaline light brown. Adomen brown, broad lateral zones on the sterna pale. Legs light brown.

Female: Unknown.

Measurements (mm). – Length, 5.7; pronotum length x width, 1.7 x 2.2; tegmen length, 6.3; interocular space, 0.6.

Ctenoneura propannulicornis sp. n.
(figs. 3C-E)

Type material. – Holotype, ♂, Malaysia, Sabah, Ulu Rurun, 115°40'30"E 4°22'N, 1500 m, 21-22.xii.1986, J. Huisman (RMNH). – Paratype. Sabah, same locality and collector as the holotype, ML, 1♂, 20.xii.1986 (RMNH).

Description. – Male: Head hidden, interocular space greater than the distance between the antennal sockets. Pronotum subelliptical. Tegmina and wings fully developed extending well beyond the end of the abdomen, discoidal sectors of the former oblique. Hind wing with distinct costal veins, the proximal ones thickened distad, intercalary vein present, media vein with one branch, cubitus vein with five branches (one of them may be forked). Front femur Type C_1; pulvilli absent, tarsal claws simple, symmetrical, arolia minute. Abdominal terga unspecialized. Supraanal plate transverse, hind margin broadly, shallowly excavated, with a large, dense group of curved setae on the left corner, style absent, right side of plate unmodified (figs. 3C-E).

Colour. – Head dark brown; antennae dark brown, the distal end with three white antennomeres, succeeded by four dark terminal segments. Pronotal disk dark brown, the lateral regions infuscated-hyaline. Tegmina dark brown-hyaline, humeral region yellowish. Hind wing infuscated, darkest in the costal vein and apical regions, lightest in the mid portion. Abdominal terga brown, lateral edges darker, supraanal plate with a white macula anteromedially. Abdominal sterna light brown, subgenital plate darker. Cerci brown, apical segment lighter. Coxae, femora, and tibiae brown, tarsi lighter.

Female: Unknown.

Measurements (mm). – Length, 5.8-6.3; prono-

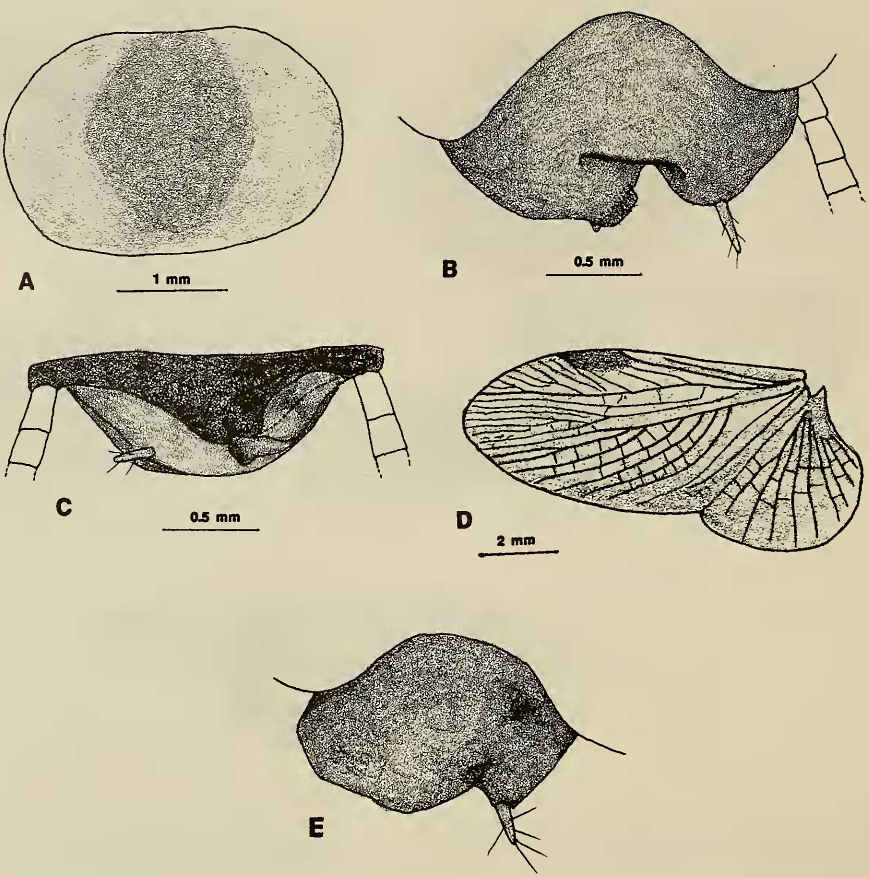


Fig. 5. *Ctenoneura* spp. – A-D, *C. birmanica* Princis, males: A. pronotum (holotype); B-D. paratype: B. subgenital plate (ventral); C, supraanal and subgenital plates (dorsal; the dotted line indicates the margin of the supraanal plate that is hidden by one of the lobes of the subgenital plate); D. hind wing. – E, *C. misera* Bey-Bienko, male holotype, subgenital plate (ventral) (redrawn from Bey-Bienko, 1970).

tum length x width, 1.9 x 2.3-2.4; tegmen length, 7.1-8.3; interocular space, 0.6.

Comments. – I place this species near *annulicornis* (hence the specific name), because both taxa have a dense tuft of setae in the left corner of the subgenital plate. Differences in the shape of the right side of the plate, absence of the left style (in *propannulicornis*), and antennal colouration, separate the two species.

Ctenoneura biguttata Hanitsch
(fig. 4)

Ctenoneura biguttata Hanitsch, 1932a: 6. Holotype, ♂, Sumatra, Deli, Fulmek, 1921-26, Brastagi, Urwald, viii.1924, R. Ebner; Type Orth. 375 (HDEO), [examined]; Bruijning 1948: 41, 149; Princis (1953) 1954: 207 (footnote), 1963: 103.

Redescription. – Male: Head exposed, eyes wide apart, interocular space greater than distance between antennal sockets. Pronotum subcircular (fig. 4A). Tegmina and wings extending beyond end of abdomen, veins and cross veins of both distinct, discoidal sectors of the former oblique (fig. 4C). Wing with six costals, the first four with distal ends merging into a marginal dark patch; intercalaray vein present between the radial and median; media vein branched, cubitus with five branches (fig. 4D). Front femur Type C_1; pulvilli and arolia absent, tarsal claws symmetrical, simple (not serrated). Abdominal terga unspecialized. Supraanal plate transverse, very narrow, hind margin entire (fig. 4E). Subgenital plate asymmetrical, with a small cylindrical style on the left side, (Hanitsch stated, 'styles not observed'), right side with a pair of curved spinelike processes directed towards the left (figs. 4B, E).

Colour. – Head shining black; antennae pale yellowish with darker terminal segments. Pronotum shiny black medially, dark reddish brown laterally, and with a pair of orangish maculae on either side of the anterior margin (fig. 4A). Tegmina uniformly dark brown (fig. 4C). Wings hyaline, brown, with a dark patch along the anterior costal region (fig. 4D). Abdominal terga light brown, sterna dark brown, subgenital plate with an orangish area distad. Legs with coxae and femora dark brown, tibiae and tarsi yellowish. Cerci with brown basal segments, remaining cercomeres yellowish.

Female: Unknown.

Measurements (mm). – Length, 5.7; pronotum length x width, 1.7 x 2.2; tegmen length, 7.3; interocular space, 0.8.

Ctenoneura birmanica Princis
(figs. 5A-D)

Ctenoneura birmanica Princis, (1953) 1954: 206, fig. 5. Holotype, ♂, Kambaiti, N. E. Burma, 7000 ft., 25.v.1934, R. Malaise (NRSS) [examined]; Princis 1963: 102.

Ctenoneura major (nec Hanitsch, 1925); Princis 1950: 203, 204 (♂), 1963: 102.

Material examined. – Holotype, and paratypes. Burma. NRSS: 1 ♂, same locality and collector as holotype, 2000 m, 28.v.1934. ZILS: 1 ♂, same data as holotype; 1 ♂, same locality and collector as holotype. 2000 m, 29.v.1934.

Redescription. – Male: Head hidden or slightly exposed; interocular space greater than distance between ocellar spots and antennal sockets. Pronotum subelliptical (fig. 5A). Tegmina and wings fully developed extending well beyond end of abdomen, discoidal sectors of former oblique. Hind wing with the distal ends of the proximal costal veins reaching only to the dense spot near the costal margin; intercalary vein present, media vein with two branches (one forked), cubitus vein with six branches (one forked) (fig. 5D). Front femur Type C_1; pulvilli ab-

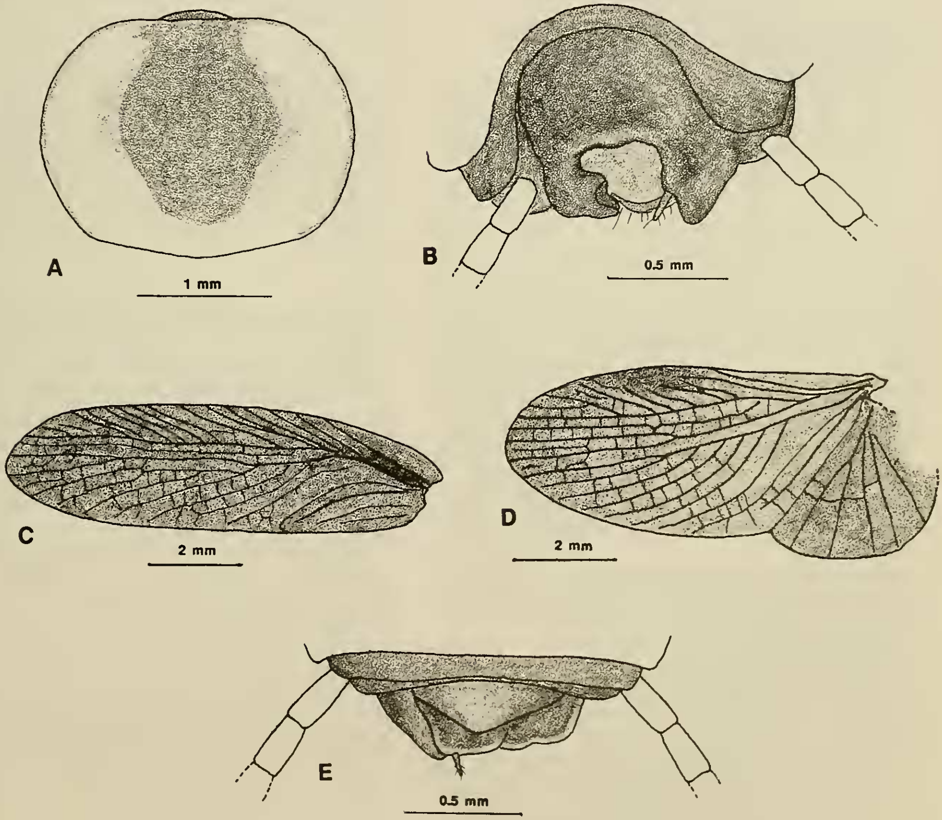


Fig. 6. *Ctenoneura brunnea* Hanitsch, male holotype. – A. pronotum; B. subgenital plate (ventral); C, D. left tegmen and hind wing; E. supraanal and subgenital plates (dorsal).

sent, tarsal claws symmetrical, simple, arolia minute. Supraanal plate transverse, hind margin convexly rounded, symmetrical, entire (fig. 5C). Subgenital plate asymmetrical, divided by a medial excavation, one lobe on the left side bearing a cylindrical style, two overlapping lobes on the right side, the dorsal one upturned (in the holotype only it partly covers the right side of the supraanal plate), the ventral lobe with minute spicules near its distal margin (figs. 5B, C).

Colour. – Antennae dark brown with pale junctions between individual segments. Head reddish brown. Pronotal disk reddish brown, lateral areas dark-hyaline (fig. 5A). Tegmina brownish, hyaline. Hind wings weakly infuscated. Abdomen dark brown, supraanal plate black. Legs brown. Cerci brown, proximal cercomeres darker on both surfaces.

Female: Unknown.

Measurements (mm). – Body length, 7.7-8.1; pronotum length x width, 2.1-2.2 x 3.0; tegmen length, 10.0-10.4; interocular space, 0.8-0.9.

Ctenoneura misera Bey-Bienko
(fig. 5E)

Ctenoneura misera Bey-Bienko, 1969: 832, fig. 1 (Russian). Holotype ♂, S. China, Yunnan, Tapa-shan Mountains, near Pin P'ien, 1300 m, 23.vi.1956, Huen K'e-yen; in ZINR. [not examined]; 1970: 528 (English translation).

Description (after Bey-Bienko). – Male: Small. Head with flat vertex, almost pendent (overhanging), forming an obtuse angle with the frons; interocular space slightly more than double the distance between antennal sockets. Pronotum one and one half times as wide as long, with broad transparent lateral parts, hind margin with a narrower hyaline border. Hind wings with oblique branches of the radius distinct, vein between radius and media arched backwards; cubitus vein with seven branches. Subgenital plate as in fig. 5E [style in the left posterior corner]. Cerci long, thickened towards the bases, terminal segment not spine-like.

Colour. – Rusty yellow. Head chestnut brown, antennae brownish yellow. Hind wing just visibly infuscate, yellowish along costal margin.

Female: Unknown.

Measurements (mm). – Body length, 6.8; pronotum length x width, 2.0 x 3.0; tegmen length, 8.0; overall length, 10.0.

Comments. – According to Bey-Bienko, this species is similar to *yunnanea* from China and *kemneri* from Java, but clearly distinguished by the colour of head and pronotum, small body, and structural details of the subgenital plate. The subgenital plate (fig. 5E) of *misera* more closely resembles that of *birmanica* (fig. 5B) than it does *yunnanea* (fig. 7F) or *kemneri* (fig. 7C).

Ctenoneura brunnea Hanitsch
(fig. 6)

Ctenoneura brunnea Hanitsch, 1929a: 266, 292, fig. 5; 1932b: 52, 81. Holotype, ♂ [Hanitsch did not indicate the sex], Gunung Singgalong (Sumatra, Westkust), 1800 m, 1925, E. Jacobson; Type Orth. 362, in HDEO [examined]; Bruijning 1948: 41, 148: Princis (1953) 1954: 208, fig. 8 (♂) Princis 1963: 102.

Additional material. – Sumatra. RMNH: N. Sumatra, Bivouac One, Mt. Bandahara, 3°43'N 97°41'E, ca. 810 m, 1 ♂, 25.vi. –5.vii.1972, J. Krikken.

Redescription. – Male (Hanitsch did not determine the sex of the type): Head covered, interocular space less than distance between antennal sockets. Pronotum subcircular (fig. 6A). Tegmina and wings fully developed extending beyond end of abdomen, veins of the former distinct, not raised, discoidal sectors oblique (fig. 6C). Hind wing with a forked media vein, intercalary vein present, cubitus with six branches (fig. 6D). Front femur Type C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia subobsolete. Abdominal terga unspecialized. Supraanal plate strongly transverse, shallowly trigonal (fig. 6E). Subgenital plate asymmetrical, hind margin deeply, widely excavated, with a small cylindrical style on the left side along the inner margin of the excavation (fig. 6B).

Colour. – Head shiny dark reddish brown; antennae dark brownish black. Pronotal disk dark reddish brown, lateral borders broad, hyaline, partially yellowish (fig. 6A). Tegmina shining brown. Wings brownish, darker along the distal half of the costal margin and apically (fig. 6D). Abdomen yellowish to reddish brown, lateral borders darker. Cerci dark brown to black. Coxae, femora, and tibiae reddish brown, tarsi yellowish.

Female: Unknown.

Measurements (mm). – Length, 5.6-6.5; pronotum length x width, 1.6-1.8 x 2.1-2.3; tegmen length, 7.1-8.5.; interocular space, 0.5-0.7.

Ctenoneura kemneri Princis
(figs. 7A-E)

Ctenoneura kemneri Princis, 1967: 146, fig. 1. Holotype ♂, Tjitjoroeng, Java, 23.i.1921, N. A. Kemner (ZILS) [examined] ; Princis 1971: 1138.

Redescription. – Male: Head hidden, interocular space wrinkled, slightly less than the distance between the antennal sockets. Pronotum strongly transverse,

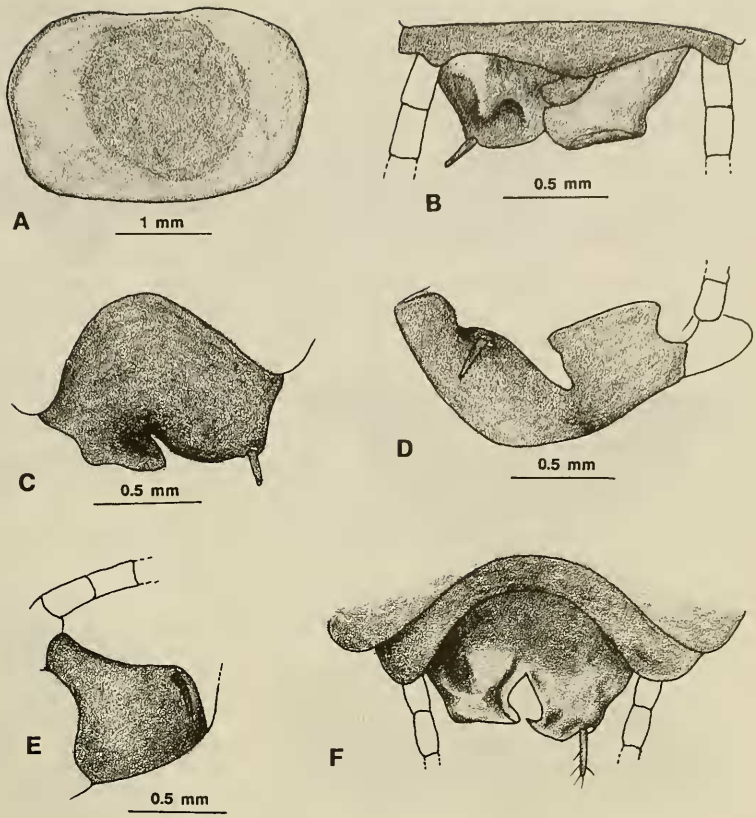


Fig. 7. *Ctenoneura* spp. A-E. – *C. kemneri* Princis, male holotype: A. pronotum; B. supraanal and subgenital plates (dorsal); C. subgenital plate (ventral); D. subgenital plate (rear view); E. subgenital plate (left lateral). – F. *C. yunnanea* Bey-Bienko, male holotype, subgenital plate (ventral) (redrawn from Bey-Bienko, 1957).

its greatest width before the middle, anterior margin cucullate above the head (fig. 7A). Tegmina extending well beyond end of abdomen, discoidal sectors of the former oblique. Hind wing with distinct costal veins, not thickened distad; intercalary vein present, media vein with one branch, cubitus vein with six or seven branches (one of the branches may be forked). Front femur Type C_1, terminal spine very small; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. (Princis claimed that only the fourth segment of the basitarsus had a pulvillus. However this 'pulvillus' is spined and is no different from the pulvillar region on the other tarsomeres. Pulvilli normally are fleshy and lack spines and I consider the basitarsus in this species as lacking a pulvillus). Abdominal terga unspecialized; supraanal plate short, transverse, hind margin convexly rounded (fig. 7B). Subgenital plate divided into two dissimilar lobes, the left one bearing a cylindrical style in the posterolateral corner (figs. 7B-D).

Colour. – Head dark brown with lighter mouthparts; antennae brown. Pronotum with yellow edging (wider laterally than on the anterior and posterior margins, disk bright red brown, the lateral parts hyaline brown. Tegmina uniformly reddish brown, veins yellowish. Hind wings darkly infuscated, part of costal vein area with a yellowish patch. Abdomen brown. Cerci brown, darker ventrally. Coxae, femora, and tibiae reddish brown, tarsi yellowish.

Female: Unknown.

Measuremnts (mm). Body length, 6.5; pronotum length x width, 2.0 x 3.2; tegmen length, 8.2; interocular space, 0.6.

Comments. – Princis stated that *kemneri* to some degree resembled *major*, chiefly because its subgenital plate is of the same type. However their lobes differ in shape. Actually Princis's drawing of the subgenital plate of *kemneri* (Princis, 1967: fig. 1) resembles that of *yunnanea* (fig. 7F), more closely than it does that of *major* (fig. 9E). My camera lucida drawing of the subgenital plate of *kemneri* differs from Princis's but slight differences in the angle from which the specimen is drawn can make a marked difference in the shape of the structure. The shapes of the subgenital plate lobes of *kemneri* (fig. 7C) show some resemblance to those of *birmanica* (fig. 5B).

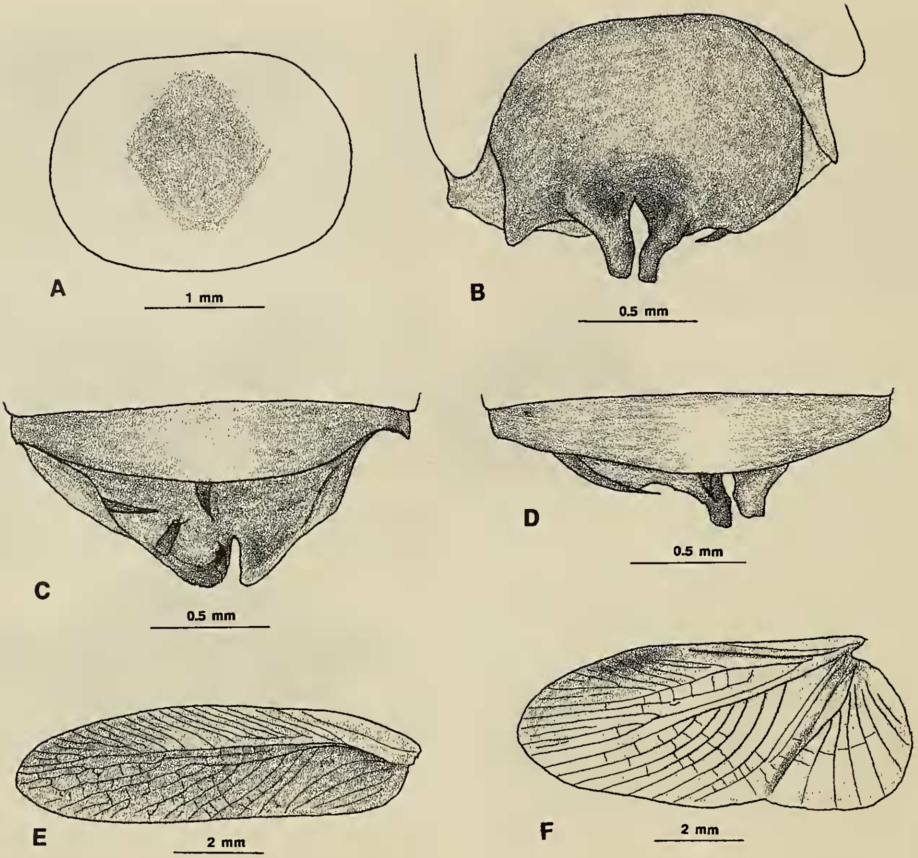


Fig. 8. *Ctenoneura fulva* Hanitsch, male holotype. – A. pronotum; B. subgenital plate (ventral); C. supraanal and subgenital plates (rear view); D. supraanal and subgenital plates (dorsal); E, F. left tegmen and hind wing.

Ctenoneura yunnanea Bey-Bienko
(fig. 7F)

Ctenoneura yunnanea Bey-Bienko, 1957: 896, 902, 912, fig. 1. Holotype ♂, Mt. Santaishan, Yunnan, China (EASC) [not examined] (Russian, English summary); Princis 1963:102.

Description (from Bey-Bienko). – Male: Pronotum transverse. Tegmina and wings with typical venation; wings with distinct oblique branches of the radius, intercalary vein between radius and media present, cubitus vein with seven branches. Supraanal plare very short. Subgenital plate with a deep round emargination, right margin thickened, style long, thin, placed on the upper left margin of the plate (fig. 7F). Cerci moniliform.

Colour. – Brownish yellow. Vertex distinctly bordered above antennal sockets. Pronotal disk brownish black, lateral parts yellow. Cerci yellow.

Female: Unknown.

Measurements (mm). – Body length, 7.0; pronotum length, 2.0; tegmen length, 8.5.

Comments. – Bey-Bienko stated that this species strongly resembles *hanitschi*. However, its subgenital plate is similar to that of *brunnea* and *kemneri*.

Ctenoneura fulva Hanitsch
(fig. 8)

Ctenoneura fulva Hanitsch, 1925: 78, 101, figs. 13-14 (♂ & ♀). Lectotype (here designated) ♂, Mr. Murud, Sarawak, 6000 ft., Dr. E. Mjöberg, Sarawak Mus. dd 1925; Type Orth. 300$^{1}/_{3}$, in HDEO [examined]. [Hanitsch listed six specimens in his original description, three ♂♂ from Mt. Murud, and one ♂ and two ♀♀ from Mt. Dulit; there are only two paralectotypes in the HDEO, and neither one is *fulva*; see comments, below]; Princis 1933: 303, 329; Bruijning 1948: 41, 148; Princis (1953) 1954: 207, fig. 6 (♂); Princis 1963: 101.

Redescription. – Male: Head covered by pronotum, interocular space greater than distance between antennal sockets. Pronotum subelliptical (fig. 8A). Tegmina and wings extending well beyond end of body, the former with proximal costal veins arising from a common trunk, the distal ones singly, discoidal sectors oblique (fig. 8E). Hind wing with intercalary vein, media vein with two branches, cubitus with six simple branches (fig. 8F). Front femur Type C_1; pulvilli and arolia absent, tarsal claws symmetrical, simple. Abdominal terga unspecialized. Supraanal plate short transverse, hind margin shallowly convex (figs. 8C, D). Subgenital plate asymmetrical, hind margin with a pair of weakly dissimilar lobes, and a small cylindrical style on the left side adpressed to the surface, its apex directed anteriorly. The style is hidden in ventral view but can be seen in end view. The tips of two apically acute structures, probably genital phallomeres, protrude laterally, and dorsally from beneath the supraanal plate (figs. B-D).

Colour. – Head dark reddish brown, shiny, antennae dark brown. Pronotal disk reddish brown, surrounding area broad, hyaline (fig. 8A). Tegmina brownish yellow, humeral and costal area lighter (fig. 8E). Wings pale hyaline with a yellowish tinge, anterior portion with a dark area along the anterior margin where the ends of the proximal costals merge (fig. 8F). Abdominal terga brown, terminal segments darker, supraanal plate with a pale medial zone. Abdominal sterna light brown, margins darker. Legs brown.

Female: Not seen.

Measurements (mm). – Length, 6.6; pronotum length x width, 1.9 x 2.7; tegmen length, 9.5; interocular space, 0.7.

Comments. – Two of Hanitsch's paralectotypes are not *fulva.* One from Mt. Murud (Type Orth. $300^{3}/_{3}$) is a new species, *murudensis,* described below. The other paralectotype, from Mt. Dulit (Type Orth. $300^{2}/_{3}$), is possibly new but I am not describing it because its subgenital plate is distorted and it is difficult to see the shape of the hind margin.

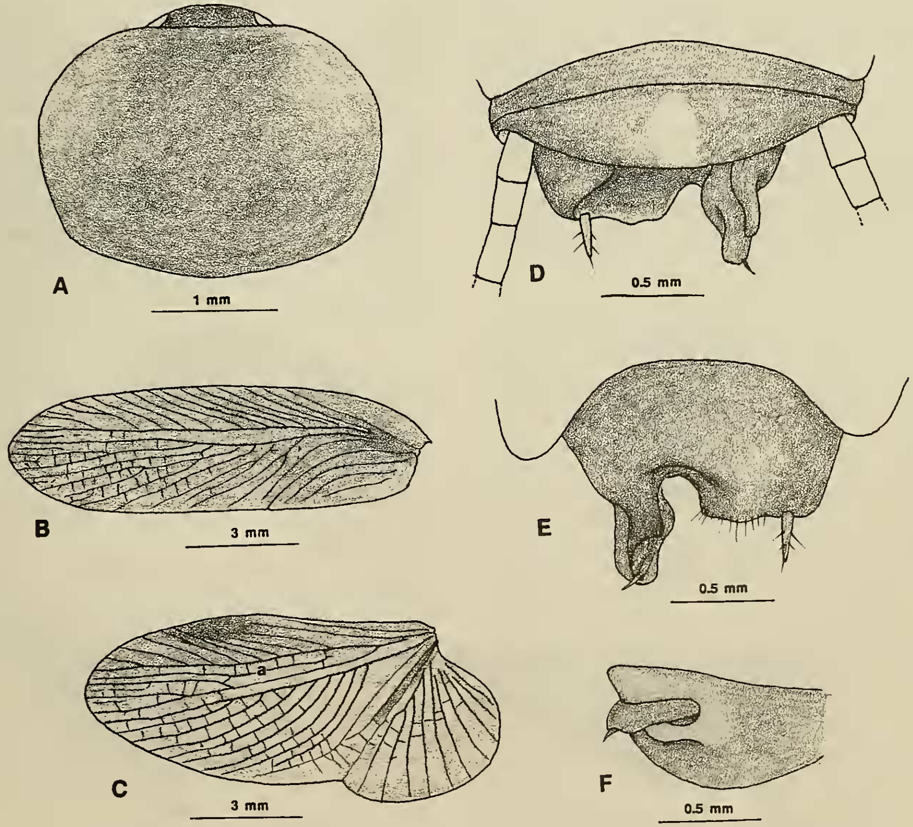


Fig. 9. *Ctenoneura major* Hanitsch, male holotype. A. pronotum; B, C. left tegmen and hind wing; a = intercalary vein. D. supraanal and subgenital plates (dorsal); E. subgenital plate (ventral); F. subgenital plate (right lateral).

Ctenoneura major Hanitsch
(fig. 9)

Ctenoneura major Hanitsch, 1925: 78, 102 (♂ & ♀). Holotype ♂, Mt. Murud, Sarawak, 6500 ft., x.1922-i.1923, Dr. E. Mjöberg, Sarawak Mus., dd 1925; Type Orth. 301, in HDEO [Hanitsch listed a ♂ and ♀ from Mt. Murud, but according to the number 301, there is only one type specimen in HDEO] [examined]; Hanitsch 1927: 9, 26, 42 (in part?); Bruijning 1948: 41, 148; Princis (1953) 1954: 207, fig. 7 (♂); Princis 1963: 101.

Redescription (Hanitsch described both ♂ & ♀ in the same paragraph. His description can not be used to distinguish between the sexes). – Male: Head slightly exposed, interocular space less than the distance between ocellar spots and antennal sockets. Pronotum suborbicular (fig. 9A). Tegmina and wings extending beyond end of abdomen, the former with distinct, but not thickened veins, discoidal sectors oblique (fig. 9B). Hind wing with eight costals, the distal ends of the first three merging into a thickening, intercalary vein present, media with two branches, cubitus vein with eight rami (fig. 9C). Front femur Type C_1; pulvilli absent, tarsal claws simple, symmetrical, arolia minute. Abdominal terga unspecialized. Supraanal plate transverse, very narrow, hind margin convex, entire (fig. 9D). Subgenital plate asymmetrical, a small cylindrical style on the left side near the posterior corner, right side produced, the process directed posteriorly (figs. 9D-F).

Colour. – Head reddish and dark brown, shining, ocelli pale, antennae dark brown. Pronotal disk dark reddish brown (fig. 9A). Tegmina brown (fig. 9B). Wings brown, thickened costal vein region darker (fig. 9C). Abdomen brownish yellow, hind margin of subgenital plate in part yellowish. Cerci fuscous brown. Legs dull brownish yellow.

Female. Not seen.

Measurements (mm). – Length, 9.7; pronotum length x width, 2.2 x 3.0; tegmen length, 11.1; interocular space, 0.7.

Ctenoneura hanitschi Princis
(fig. 10)

Ctenoneura hanitschi Princis, (1953) 1954: 204, fig. 1 (♂. Holotype, ♂, Sibajak, Sumatra, 1600 m, Mjöberg; (NRSS) [examined]; 1963: 102.
Ctenoneura major (nec Hanitsch, 1925); Hanitsch 1929b: 3, 18 (in part, ♂).

Redescription. – Male: Head hidden, interocular space greater than the distance between antennal sockets. Pronotum subrectangular (fig. 10A). Tegmina and wings fully developed extending well beyond end of abdomen, the former with oblique discoidal veins. Hind wing with an intercalary vein. Front femur Type C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. Abdominal terga unspecialized. Supraanal plate transverse, very short, hind margin shallowly convex, entire (fig. 10C). Subgenital plate asymmetrical, with a cylindrical style on the left side; the right side has a process that is

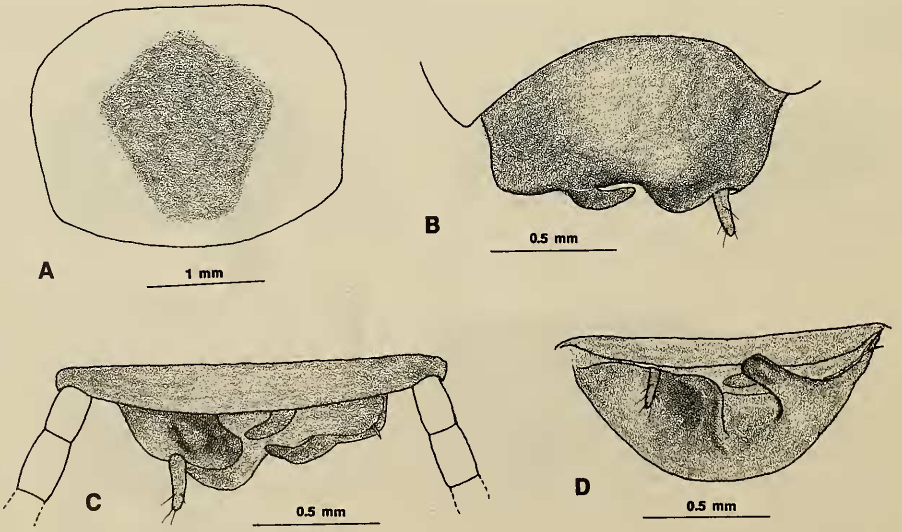


Fig. 10. *Ctenoneura hanitschi* Princis, male holotype. – A. pronotum; B. subgenital plate (ventral); C. supraanal and subgenital plates (dorsal); D. supraanal and subgenital plates (rear view).

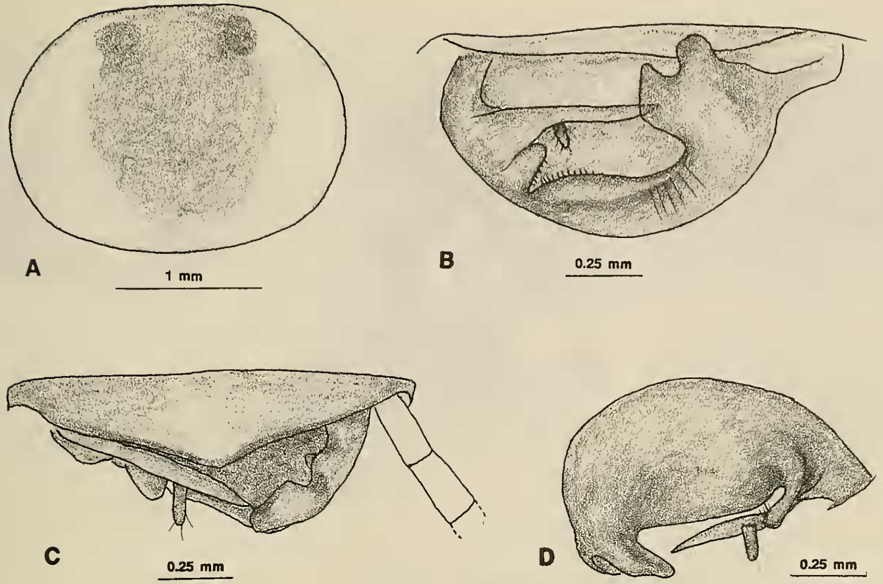


Fig. 11. *Ctenoneura mjoebergi* Princis, male holotype. – A. pronotum; B. supraanal and subgenital plates (rear view); C. supraanal and subgenital plates (dorsal); D. subgenital plate (ventral).

curved dorsad towards the left (figs. B-D).

Colour. – Head dark reddish brown; antennae dark brown, monochromatic. Pronotal disk with a sublozenge-shaped reddish brown macula narrowly margined with yellow, broad lateral zones yellowish-hyaline (fig. 10A). Tegmina brownish. Hind wing weakly infuscated. Abdomen brown. Legs dark to yellowish brown.

Female: Unknown.

Measurements (mm). – Body length, 7.3; pronotum length x width, 2.2 x 2.5; tegmen length, 9.4; interocular space, 0.6.

Ctenoneura mjoebergi Princis
(fig. 11)

Ctenoneura mjoebergi Princis, (1953) 1954: 206, fig. 4 (♂). Holotype, ♂, O. Borneo, Pajau River, [Kalimantan], Mjöberg; in (NRSS) [examined].

Ctenoneura fulva (nec Hanitsch, 1925). – Hanitsch 1933: 235 (in part; Mt. Tibang and Pajau River material); Princis 1963: 102.

Material examined. – Holotype, and paratype: Kalimantan. 1♂, same data as holotype (NRSS). Sarawak. Mt. Tibang, 1400 m, 1 ♂, Mjöberg (NRSS).

Redescription. – Male: Head concealed, interocular space greater than distance between antennal sockets. Pronotum subelliptical (fig. 11A). Tegmina and wings fully developed extending well beyond end of abdomen, the former with oblique discoidal sectors. Hind wing with an intercalary vein, media vein with a forked branch, cubitus with five branches (one forked). Front femur Type C_1; pulvilli absent, tarsal claws simple, symmetrical, arolia minute. Supraanal plate symmetrical, transverse, shallowly trigonal, hind margin entire (fig. 11C). Subgenital plate asymmetrical with several processes, one of which on the left side is elongated and bears a single style (figs. 11B-D).

Colour. Head reddish brown; antennae with segments on proximal half yellow (except for the first two brown antennomeres), distal half brownish. Pronotal disk reddish brown with a pair of dark spots on anterior margin, lateral zones hyaline (fig. 11A). Tegmina brownish, subcostal vein yellow. Hind wing lightly infuscated. Abdomen brown, the sterna lighter medially and laterally. Legs and cerci brown.

Female: Unknown.

Measurements (mm). – Length, 5.5-5.8; pronotum length x width, 1.5-1.7 x 2.1-2.3; tegmen length, 6.6-6.8; interocular space, 0.6.

Ctenoneura tuberculata Princis
(fig. 12)

Ctenoneura tuberculata Princis, (1953) 1954: 205, fig. 2 (♂). Holotype, ♂, Sumatra, Sibajak, Mjoeberg (NRSS) [examined]; Princis 1963: 101.

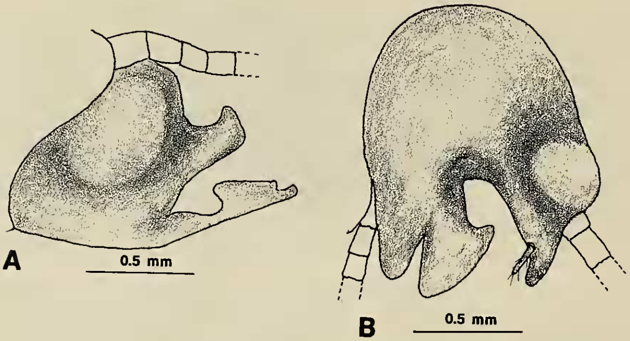


Fig. 12. *Ctenoneura tuberculata* Princis, male from Mt. Bandahara. A. subgenital plate (left lateral); B. subgenital plate (ventral); C. subgenital plate (right lateral).

Ctenoneura major (nec Hanitsch, 1925); Hanitsch 1929b: 3, 18 (♂, in part); Princis 1963: 101.

Additional material. – Sumatra. N. Sumatra, Bivouac One, Mt. Bandahara, 3°43'N 97°41'E, ca. 810 m, 1♂, 25.vi.–5.vii.1972, J. Krikken (RMNH).

Redescription. – Male: Head hidden, interocular space greater than the distance between antennal sockets. Pronotum subelliptical. Tegmina and wings fully developed extending beyond end of abdomen, the former with oblique discoidal sectors. Hind wing with intercalary vein, media vein with one branch, cubitus vein with six branches. Front femur Type C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. Abdominal terga unspecialized. Supraanal plate shallowly trigonal, apex rounded and medially incised. Subgenital plate strongly asymmetrical, hind margin deeply divided forming two asymmetrical lobes, the one on the left bearing a small cylindrical style below its apex on the inner margin of the excision; the lobe on the right deeply excised; a large round swelling is located along the margin distad on the left side (figs. 12A-C).

Colour. – Head reddish brown; antennae dark brown. Pronotal disk reddish brown the surrounding area hyaline and partly yellowish. Tegmina with humeral and costal vein areas yellowish, remainder brown. Hind wing with yellowish tinge. Abdomen brown, subgenital plate reddish brown (holotype), or partly yellowish. Legs light brown. Cerci light brown dorsally, darker brown ventrally.

Female: Unknown.

Measurements (mm). – Body length, 6.0; pronotum length x width, 1.7-1.8 x 2.3-2.5; tegmen length, 7.2-9.0; interocular space, 0.5-0.6.

Ctenoneura spinastyla sp. n.
(fig. 13)

Type material. – Holotype, ♂, Pahang, F.M.S., 'Cameron's Highlands', No. 4 Camp, 4800 ft., 14.-viii.1923, H.M., Pendlebury (incorrectly labelled by Hanitsch, *Ctenoneura major* Hanitsch); in HDEO.

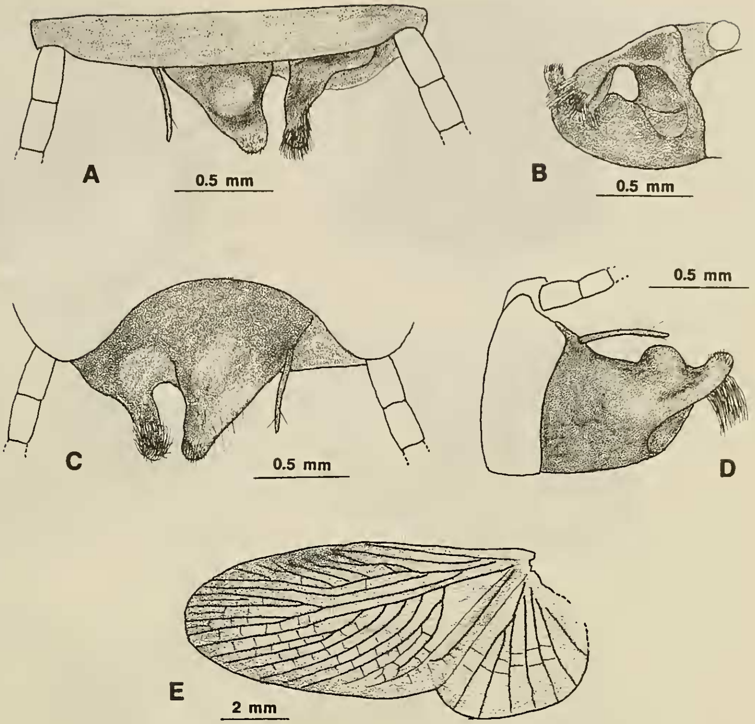
Description. – Male: Head hidden, interocular space greater than the distance between ocellar spots and antennal sockets. Pronotum suboval. Tegmina and wings extending well beyond end of abdomen, discoidal sectors of the former oblique. Hind wing with distinct costal veins, intercalary vein present, media vein forked beyond the middle, each branch again dividing (left wing, fig. 13E), or with two branches (one of them forked, right wing); cubitus vein with five or six branches (two of them branching once or twice) (fig. 13E). Front femur Type C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. Abdominal terga unspecialized. Supraanal plate strongly transverse, very short, hind margin almost truncate (fig. 13A). Subgenital plate asymmetrical with a pair of large dissimilar processes, the left one with a bulbous swelling near the apex, both lobes setose apically, those on the right much longer; on the left margin near the base of the plate is a long, slender, spine-like style (figs. 13A-D).

Colour. – Head reddish brown; antennal segments black (most of the antennae are missing). Pronotal disk reddish brown, becoming yellowish in the posterior region, lateral zones yellowish-hyaline. Tegmina with humeral zone yellowish, remainder brownish-hyaline, mediastine vein very dark. Abdomen, cerci, and legs brown.

Female: Unknown.

Measurements (mm). – Length, 8.2; pronotum

Fig. 13. *Ctenoneura spinastyla* sp. n., male holotype. – A. supraanal and subgenital plates (dorsal); B. subgenital plate (right lateral); C. subgenital plate (ventral); D. subgenital plate (left lateral); E. left hind wing.



length x width, 2.3 x 2.9; tegmen length, 11.1; interocular space, 0.8.

Etymology. – The specific name refers to the slender, greatly elongated left style.

Comments. – The two setose processes, and the spine-like style on the subgenital plate are unique and readily identifies this species.

Ctenoneura uncata sp. n.
(fig. 14)

Type material. – Holotype, ♂, Malaysia, S.W. Sabah, nr. Long Pa Sia (East), c. 1000 m, Mal. trap 5, 1-13.iv.1987, C. v. Achterberg; in RMNH . – Paratypes: Sabah. RMNH: The following were collected by C. v. Achterberg: S.W. Sabah, nr. Long Pa Sia (West), c. 1050 m, Mal. trap 3, 1 ♂, 1-14.iv.1987; same data as holotype, 1 ♂, 25.xi. –7.xii.1987; nr. Long Pa Sia (West), 1010 m, Mal. trap 1b, 1 ♂, Mal. trap 2, 1020 m, 2 ♂♂, 25.xi. –8.xii.1987. The following were collected by J. Huisman: Sg. Malabit, Rd. Long Sia-L Semado, 115°41'E 4°21'N, 1175 m, 1 ♂, 8.xii.1986; Long Pa Sia, confl. S. Maga and S. Pa Sia, 4°26'30"N 115°40'E, high moist forest, sandsoil, 1350 m, 2 ♂♂, 16-19.x.1986. One ♂ retained in MCZ.

Description. – Male: Head hidden, interocular space greater than the distance between the ocellar spots and antennal sockets. Pronotum suboval (fig. 14A). Tegmina and wings fully developed extending beyond end of abdomen. Hind wing with intercalary vein, media vein with one branch, cubitus vein with five or six branches (some may be forked). Front femur Type C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. Abdominal terga unspecialized. Supraanal plate transverse, subtrigonal (fig. 14E). Subgenital plate strongly asymmetrical, the right side with a broad, elongated lobe that curves towards the left where there is a broad, apically curved, hook-like process; style absent (figs. 14B-E).

Colour. – Head dark reddish brown; basal four antennal segments brown, succeeded by pale (yellowish) antennomeres to about the middle, those on the distal half brown, with as many as six terminal (or preterminal) white antennomeres (some lacked, or had only two or three white segments, but these may have been damaged specimens). Pronotal disk with a broad, dark reddish brown macula that extends to both the anterior and posterior margins, lateral areas usually hyaline (fig. 14A), sometimes partly opaque yellowish. Tegmina with humeral and proximal half of the costal vein region yellowish-hyaline, the remainder dark hyaline-brown. Hind wing with yellowish tinge in the costal vein region. Abdomen brown, supraanal plate with a white area, subgenital plate may be a lighter brown and sometimes partly yellow.

Female: Unknown.

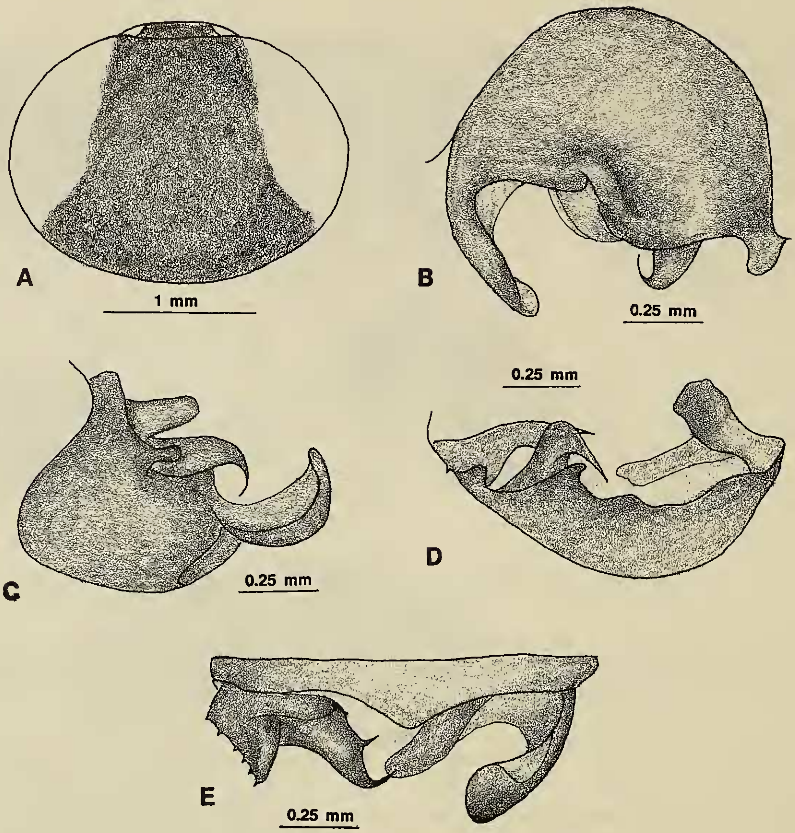


Fig. 14. *Ctenoneura uncata* sp. n., male paratype from near Long Pa Sia. – A. pronotum; B. subgenital plate (ventral); C. subgenital plate (left lateral); D. subgenital plate (rear view); E. supraanal and subgenital plates (dorsal).

Measurements (mm). – Length, 5.0-5.8; pronotum length x width, 1.6-1.7 x 2.1-2.3; tegmen length, 7.0-7.7; interocular space, 0.6.

Etymology. – The specific name refers to the hook-shaped structure on the left side of the subgenital plate.

Ctenoneura poringa sp. n.
(figs. 15A-C)

Type material. – Holotype, ♂, Malaysia, Sabah, Poring hot spring, Sg. Kepungit, E. of park boundary, c. 116°42'E 6°03'N, 480 m, ML, 26.xi.1986, J. Huisman; in RMNH.

Description. – Male: Head hidden under pronotum, interocular space greater than distance between ocellar spots and antennal sockets. Pronotum suboval. Tegmina and wings fully developed extending beyond end of abdomen, the former with oblique discoidal sectors. Hind wing intercalary vein present, media vein with one branch, cubitus vein with six rami (one may be branched). Front femur Type C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. Abdominal terga unspecialized. Supraanal plate transverse. Subgenital plate asymmetrical, hind margin deeply, widely excavated, with a large whitish, membranous area bearing a cylindrical style at its basal end (figs. 15A-C).

Colour. – Head dark brown; two basal antennal segments dark brown succeeded by about 25 yellowish antennomeres, then three or four brown and three or four white segments, terminating in one or two brown ones (some terminal segments may have been missing). Pronotal disk dark reddish brown, anterior and posterior areas darker, lateral regions hyaline. Tegmina with humeral region yellow-hyaline, remainder brown-hyaline. Hind wing infuscated, darker along the costal vein area. Abdominal terga brown, supraanal plate with a white medial zone. Abdominal sterna light brown, subgenital plate darker. Cerci with four basal segments brown, distal three segments yellowish. Coxae and femora brown, tibiae and tarsi pale.

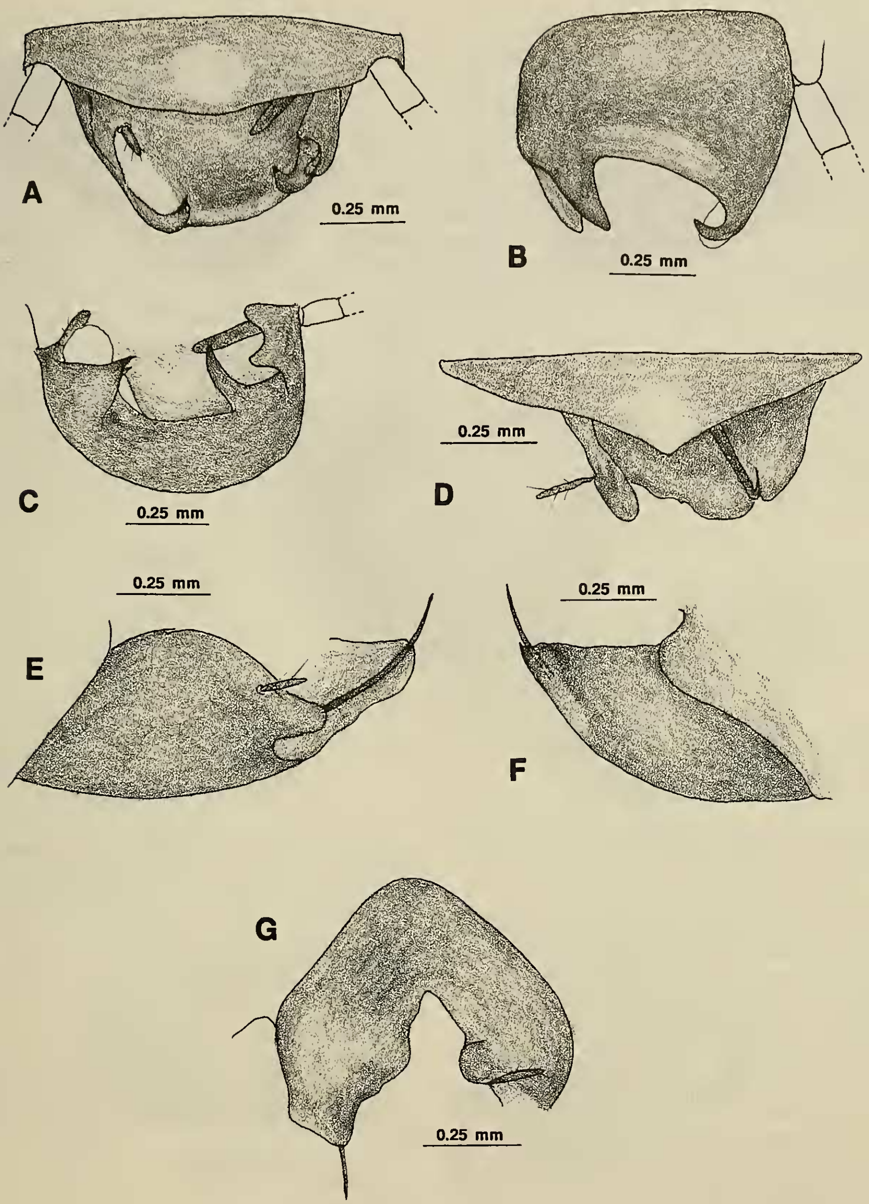


Fig. 15. *Ctenoneura* spp. A-C. *C. poringa* sp. n., male holotype. A. supraanal and subgenital plates (dorsal); B. subgenital plate (ventral); C. subgenital plate (rear view). – D-G. *C. luma* Sp. n., male holotype. D. supraanal and subgenital plates (dorsal); E. subgenital plate (left lateral); F. subgenital plate (right lateral); G. subgenital plate (ventral).

Female: Unknown.

Measurements (mm). – Length, 5.0; pronotum length x width, 1.6 x 2.0; tegmen length, 6.3; interocular space, 0.5.

Etymology. – The species is named for Poring hot spring.

Ctenoneura luma sp. n.

(figs. 15D-G)

Type material. – Holotype, ♂, Malay Penin., Perak, Larut Hills, 4000-4500 ft., ii. -iii.1905, R. Shelford (incorrectly labelled *C. fulva*, by Hanitsch); in HDEO. – Paratype. Perak. HDEO: Perak, F.M.S., Jor Camp, 2000 ft., 1♂,

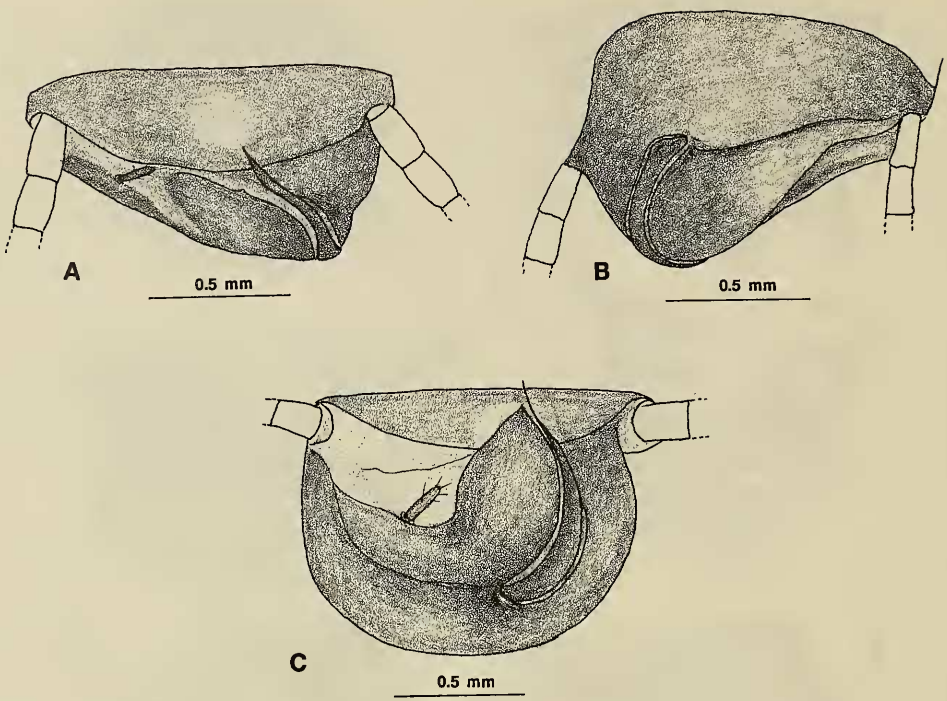


Fig. 16. *Ctenoneura scutica* sp. n., male holotype. A. supraanal and subgenital plates (dorsal); B. subgenital plate (ventral); C. subgenital plate (rear view).

6.ix.1922, 2♂, at light, 27.viii.1922, E. Sumiind (labelled *C. pumosa*, mss name, by Hanitsch).

Description. – Male: Head barely exposed, interocular space greater than the distance between ocellar spots and antennal sockets. Pronotum suboval. Tegmina and wings fully developed, the former with oblique discoidal sectors. Hind wing with distinct costal veins, the proximal ones thickened distad, intercalary vein present, media vein bifurcate (one of the rami also branched), cubitus vein with six branches. Front femur Type C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. abdominal terga unspecialized. Supraanal plate trigonal, entire (fig. 15D). Subgenital plate asymmetrical, deeply excavated medially forming two dissimilar lobes, with a slender style on the left side (the style was accidentally broken off and lost after the drawings were made); on the right side, a slender, thorn-like structure appears to arise from the margin of the plate but actually lies pressed tightly against the dorsal surface, and its apex protrudes beyond the the right lobe margin (figs. 15E-G).

Colour. Head reddish brown. Pronotal disk reddish brown, the macula narrowly margined with yellow, lateral portions hyaline. Tegmina and wings pale hyaline. Abdominal terga light brown, supraanal plate with a white macula medially near the hind margin, subgenital plate darker except for a pale zone around the medial excavation. Cerci pale. Legs light brown.

Female: Unknown.

Measurements (mm). – Length, 5.5; pronotum length x width, 1.5 x 1.8; tegmen length, 6.3; interocular space, 0.6.

Etymology. – The specific name refers to the thorn-like structure that arises on the dorsal surface of the subgenital plate and protrudes beyond the right lobe.

Ctenoneura scutica sp. n.

(fig. 16)

Type material. – Holotype ♂, Malaysia, Sabah, one half way Rd. Melligan, Long Pa Sia, 115°42'E 4°35'N, 1200 m, ML, 15.xii.1986, J. Huisman; in RMNH.

Description. – Male: Head hidden, interocular space greater than the distance between ocellar spots or antennal sockets. Pronotum suboval. Tegmina and wings extending well beyond end of abdomen, the former with oblique discoidal sectors. Hind wing with intercalary vein, media vein with one bifurcated branch, cubitus with five branches. Front femur Type

C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. Abdominal terga unspecialized. Supraanal plate symmetrical, transverse, short, hind margin entire. Subgenital plate asymmetrical, the left side concavely excavated bearing a small cylindrical style in a white membranous area; near the mid region of the plate is a deep, narrow, oblique (towards the left) excision with a long, stout, tapering whip-like process that curves upwards and anteriorly between the smooth walls of the excision (figs. 16A-C).

Colour. – Head dark reddish brown; antennae brown, monochromatic. Pronotal disk reddish brown, darker near the anterior and posterior margins. Tegmina with humeral and proximal part of the costal vein area yellowish-hyaline, remainder slightly darker. Hind wing with a yellowish tinge, costal vein region darker. Abdominal terga brown, lateral edges and terminal segments darker, supraanal plate with a white medial zone. Abdominal sterna light brown, lateral edges darker, distal part of subgenital plate yellowish. Cerci brown, terminal segment lighter. Legs light brown.

Female: Unknown.

Measurements (mm). – Length, 5.6; pronotum length x width, 1.8 x 2.2; tegmen length, 7.6; interocular space 0.6.

Etymology. – The specific name refers to the whip-like process between the narrow incision on the subgenital plate.

Ctenoneura parascutica sp. n.
(fig. 17)

Type material. – Holotype, ♂, Malaysia, Sabah, base of S. Nologana, 1010 m, Crocker range, 115°55'E 5°10'N, UV, 10-11.x. 1986, J. Huisman (RMNH).

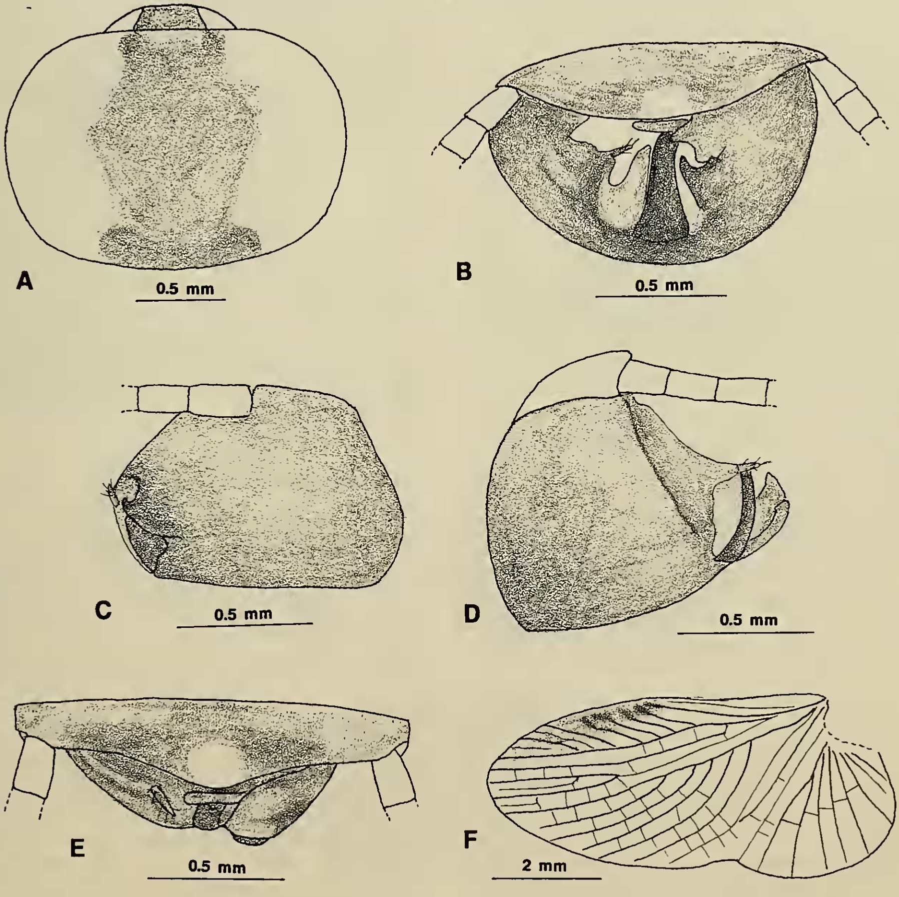


Fig. 17. *Ctenoneura parascutica* sp. n., male holotype. A. pronotum; B. Supraanal and subgenital plates (rear view); C. subgenital plate (right lateral); D. subgenital plate (left lateral); E. supraanal and subgenital plates (dorsal); F. left hind wing.

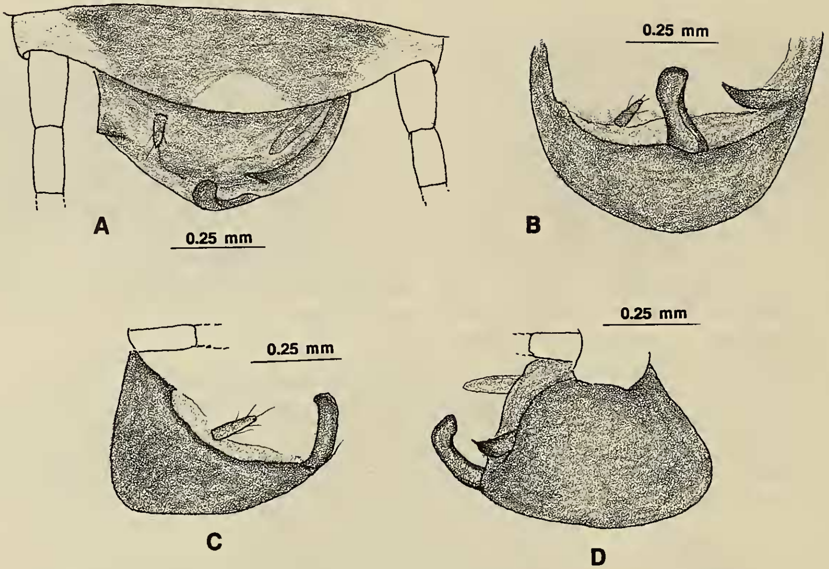


Fig. 18. *Ctenoneura kinabaluana* sp. n., male paratype from Kiau, Mt. Kinabalu. A. supraanal and subgenital plates (dorsal); B. subgenital plate (rear view); C. subgenital plate (left lateral); D. subgenital plate (right lateral).

Description. – Male: Head exposed, interocular space greater than the distance between ocellar spots and antennal sockets. Pronotum subelliptical (fig. 17A). Tegmina and wings fully developed extending beyond end of abdomen, the former with oblique discoidal sectors. Hind wing with the proximal three or four costal veins clubbed, intercalary vein present, media vein with one branch, cubitus vein with five branches (the right wing has one of the branches forked) (fig. 17F). Front femur Type C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. Abdominal terga unspecialized. Supraanal plate transverse, hind margin entire (figs. 17B, E). Subgenital plate asymmetrical, hind margin excised, with a large dark, spine-like process that curves dorsad, its apex hidden under the supraanal plate; the margins of the excision on either side of the spine-like process are irregular, and on the left side the region is unsclerotized; a small cylindrical style is on the left side (figs. 17B-E).

Colour. – Head reddish brown; antennae brown (distal halves missing). Pronotal disk reddish brown, anterior and posterior border regions darker, a small yellowish area anteriorly on each side along the edges of the macula, lateral regions hyaline (fig. 17A). Tegmina with humeral and proximal costal vein regions yellowish-hyaline, remainder darker. Hind wing with a yellowish tinge in the costal vein region (fig. 17F). Abdominal terga brown, supraanal plate with a white macula posteromedially (fig. 17E). Abdominal sterna brown, subgenital plate darker. Cerci brown, segments on distal half lighter. Legs pale.

Female: Unknown.

Measurements (mm). – Length, 5.2; pronotum length x width, 1.7 x 2.3; tegmen length, 7.3; interocular space, 0.6.

Comments. – I place *parascutica* close to *scutica* because both have a large, darkly sclerotized, curved, spine-like process on the hind margin of the subgenital plate.

Ctenoneura kinabaluana sp. n.
(fig. 18)

Material. – Holotype, ♂, B.N. Borneo [Sabah], Mt. Kinabalu, Lumu Luma, 3500 ft., 16.iv.1929 [labelled *C. fulva*, by Hanitsch] (HDEO). – Paratypes. Sabah. Same locality and date as holotype, 3500 ft., 1♂; Mt. Kinabalu, Kamboranga, 7000 ft., 2♂, 30.iii.1929 (HDEO); Malaysia, Sabah, Mt. Kinabalu Kg. Kiau, S. Kadamaian, 116°31'E 6°02'N, 720 m, UV, 1♂ 26.viii.1986, J. Huisman (RMNH).

Description. – Male: Head hidden, interocular space greater than the distance between ocellar spots and antennal sockets. Pronotum suboval. Tegmina and wings fully developed extending well beyond end of abdomen, discoidal sectors of the former oblique. Hind wing with distinct costal veins, intercalary vein present, media vein with one branch (the branch may be bifurcate), cubitus vein with six branches (some may be forked; also one of the wings has two veins fused a short distance from their bases and then separate). Front femur Type C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. Abdominal terga unspecialized. Supraanal plate transverse, hind margin convex, entire (fig. 18A). Subgenital plate asymmetrical, with a short, median process that extends postero-obliquely, or dorsad, its distal end curving anteriorly towards the supraanal plate; a cylindrical style is located on the left side and the margin to the right of the process is prolonged (figs. 18A-D). The length of the median process varies and is longest in the specimen from Kiau.

Colour. – Head reddish brown; antennae brown. Pronotal disk reddish brown, lateral zones hyaline. Tegmina with humeral and costal vein zones yellow-hyaline, remainder brown-hyaline. Hind wing infuscated, darkest in the costal vein zone. Abdominal terga brown, supraanal plate with a white macula anteromedially. Abdominal sterna brown, distal margin of subgenital plate yellowish. Cerci and legs brown. The specimen from Kiau is smaller and darker than the others: head dark brown, basal three antennomeres brown, remainder yellowish (distal segments of the antennae missing); supraanal plate yellow laterally, and with a white area posteromedially (fig. 18A). Cerci with basal segments brown, distal cercomeres yellowish. Coxae, femora, and tibiae brown, tarsi lighter.

Female: Unknown.

Measurements (mm) (male from Kiau in parentheses). – Length, 6.5-6.6 (5.3); pronotum length x width, 1.8-1.9 (1.5 x 2.1); tegmen length, 9.0 (6.7); interocular space, 0.6-0.7 (0.6).

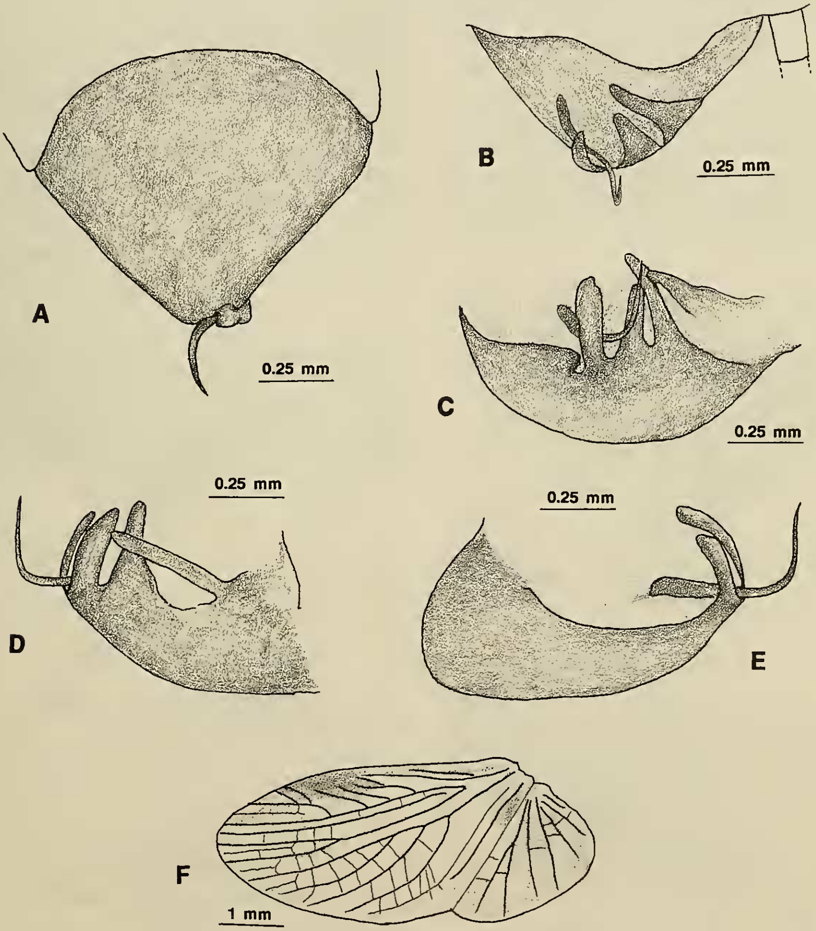


Fig. 19. *Ctenoneura triprocessa* sp. n., male holotype. A. subgenital plate (ventral); B. subgenital plate (dorsal); C. subgenital plate (rear view); D. subgenital plate (right lateral); E. subgenital plate (left lateral); F. left hind wing.

Ctenoneura triprocessa sp. n.
(fig. 19)

Type material. – Holotype ♂, Malaysia, SE. Sabah, Danum Valley Field C., c. 150 m, W.O., Mal. trap 5, 22.xi.-4.xii.1987, C. v. Achterberg & D. Kennedy (RMNH) [The type is fragmented, head and thorax, tegmina and wings, and terminal abdominal segments are mounted on cards].

Description. – Male: Head hidden, interocular space greater than the distance between ocellar spots and antennal sockets. Pronotum suboval. Tegmina and wings fully developed extending beyond end of abdomen, discoidal sectors of former oblique. Hind wing with a intercalary vein, media vein with one branch, cubitus vein with three branches (one of which may or may not be branched near its base) (fig. 19F). Front femora missing; other legs lack pulvilli, tarsal claws symmetrical, simple, arolia minute. Abdominal terga unspecialized. Supraanal plate transverse, hind margin convexly rounded, entire. Subgenital plate asymmetrical, trigonal (fig. 19A), hind margin with three long processes that curve dorsad; arising on the dorsal surface of the plate near the left process is a long filament that protrudes between the left and middle processes; style absent (figs. 19B-E).

Colour. – Head dark reddish brown; antennae with pale yellowish segments (about half the segments are missing). Pronotal disk reddish brown, slightly lighter on the anterior and posterior regions, lateral areas clear hyaline. Tegmina with humeral and proximal half of the costal vein area yellowish-hyaline, remainder light brown-hyaline. Hind wing with yellowish tinge mostly in the costal vein zone (fig. 19F). Abdomen brown, distal part of supraanal plate white, subgenital plate yellowish brown.

Female: Unknown.

Measurements (mm). – Pronotum length x width, 1.5 x 1.8; tegmen length, 5.7; interocular space, 0.5.

Etymology. – The specific name refers to the three prominent processes or prolongations on the hind margin of the subgenital plate.

Ctenoneura murudensis sp. n.
(fig. 20)

Ctenoneura fulva; Hanitsch (in part, ♂ paralectotype) 1925: 101.

Type material. – Holotype, ♂ paralectotype (Type Orth. $300^3/_3$) of *Ctenoneura fulva* Hanitsch, Mt. Murud [Sarawak], 6500 ft. (HDEO).

Description. – Male: Head hidden, interocular

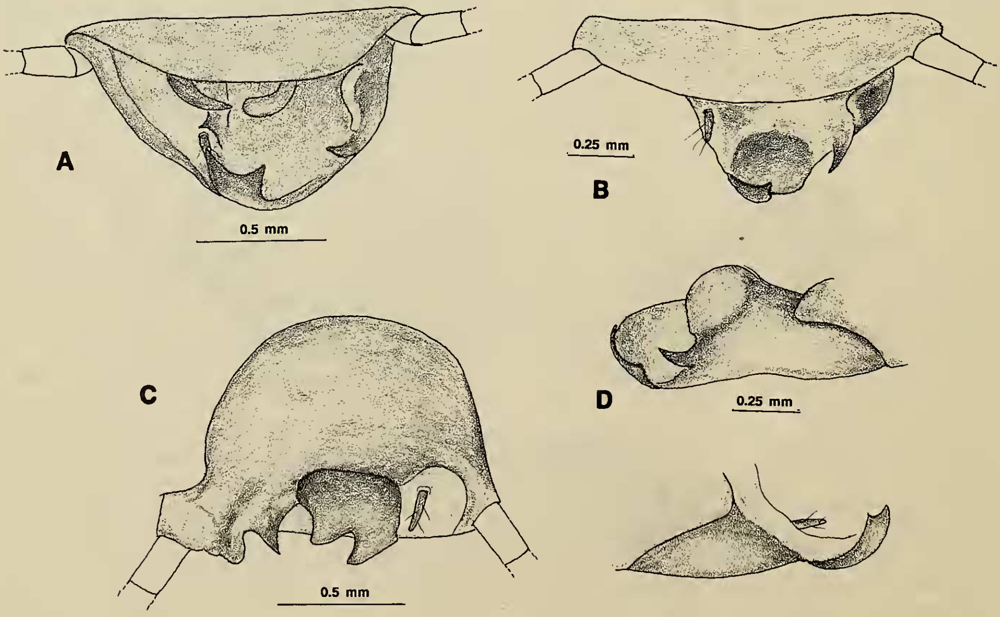


Fig. 20. *Ctenoneura murudensis* sp. n., male holotype. A. supraanal and subgenital plates (rear view); B. supraanal and subgenital plates (dorsal); C. subgenital plate (ventral); D. subgenital plate (right lateral); E. subgenital plate (left lateral).

space greater than the distance between ocellar spots and antennal sockets. Pronotum suboval. Tegmina and wings fully developed extending beyond end of abdomen, the former with oblique discoidal sectors. Hind wing with distinct costal veins, the proximal ones clubbed distally, intercalary vein present, media vein forked about at the middle, cubitus with eight unbranched rami. Front femur Type C_1; pulvilli absent, claws simple, symmetrical, arolia small. Abdominal terga unspecialized. Supraanal plate transverse, deflexed, hind margin convex, entire (figs. 20A-B). Subgenital plate asymmetrical with a small, dark, cylindrical style located in a membranous area on the left side; a darkly sclerotized lobe with a U-shaped excavation on its apical margin arises medially, and on the right side is a small acute prolongation (figs. 20A-E).

Colour. – Head light reddish brown; antennae dark brown, monochromatic. Pronotal disk light reddish brown, surrounding areas hyaline. Tegmina with humeral and proximal half of the costal vein zone yellowish-hyaline, remainder darker, hyaline. Wings pale, with a yellowish tinge, darker in the clubbed costal vein region. Abdominal terga uniformly light brown, supraanal plate without a medial white spot. Abdominal sterna yellowish-brown, distal part of subgenital plate yellow. Cerci light brown dorsad, darker ventrally. Legs light brown.

Female: Unknown.

Measurements (mm). – Length, 6.7; pronotum length x width, 1.8 x 2.3; tegmen length, 8.5; interocular space, 0.7.

Comments. – Hanitsch incorrectly considered this as *fulva*, but the subgenital plate of that species (fig. 8B) is distinctly different from *murudensis* (fig. 20C).

Ctenoneura crassistyla sp. n.
(figs. 21A-D)

Type material. – Holotype, ♂, Pahang, F. M. S., Cameron's Highlands, Tanak...., 4800 ft., 22.v.1931, H. M. Pendlebury (HDEO).

Description. – Male: Head hidden, interocular space greater than the distance between ocellar spots and antennal sockets; antennae missing. Pronotum suboval. Tegmina and wings fully developed extending beyond end of abdomen, the former with oblique discoidal sectors. Hind wings with distinct costal veins, media vein bifurcate, cubitus vein with six branches. Front femur Type C_1; pulvilli absent, tarsal claws symmetrical, simple, arolia minute. Abdominal terga unspecialized, supraanal plate strongly transverse, very short, hind margin almost truncate, entire (fig. 21A). Subgenital plate asymmetrical, hind margin deeply, unevenly excavated, with a large, stout style on the basal corner of the left side of the excavation; the apex of the style is split and a small piece of 'fleshy' tissue protrudes between the ends; right side with distal region concavely depressed (figs. 21B-D).

Colour. – Head reddish brown. Pronotum with narrow yellow edging, disk reddish brown, lateral regions hyaline. Tegmina hyaline yellow, darker on the anal field region. Hind wings pale with yellowish mostly in the costal vein region and apical part of the anterior field. Abdominal terga light brown, supraanal plate yellowish with a medial white area near the hind margin (fig. 21A). Abdominal sterna brown, subgenital plate darker. Cerci pale dorsally. Legs light brown.

Female: Unknown.

Measurements (mm). – Length, 6.4; pronotum length x width, 1.9 x 2.5; tegmen length, 8.3; interocular space, 0.7.

Etymology. – The specific name refers to the large, stout, left style.

Ctenoneura sp.

Material. – South Vietnam. HDEO: 1♂, S. Annam, Longbian Peaks, 5500-7500 ft., iv.–v.1918, C. B. Kloss (labelled *Ctenoneura major* Hanitsch, by Hanitsch).

Comments. – This species has a subgenital plate similar to that of *crassistyla*, with a large, stout, style on the basal corner of the left side (the style is not split at the apex). The media vein of the hind wing has two branches, and the cubitus vein has seven branches, one or two of which may be branched. The tarsal claws are long, simple, symmetrical, arolia absent. The supraanal plate is transverse, hind margin weakly convex. This is the only species recorded from Vietnam.

Measurements (mm). – Length, 7.8; pronotum length x width, 2.3 x 3.1; tegmen length, 10.2; interocular space, 0.8.

Ctenoneura simulans Bey-Bienko
(figs. 21E-F)

Ctenoneura simulans Bey-Bienko, 1969: 833, figs. 2,3, (♂) (Russian). Holotype ♂, S. China, Yunnan: Hsiamonyang vicinity, 900-1100 m, 6.v.1957, Hung Kuang-ti (ZINR) [not examined]; 1970: 528 (English translation).

Description (from Bey-Bienko). – Male: Small. Vertex passing roundly into frons, interocular space two and one half times wider than distance between antennal sockets. Pronotum somewhat less than one and one half times as wide as long. Hind wings with cross branches of the radius vein distinct, intercalary vein between the radius and media, almost straight;

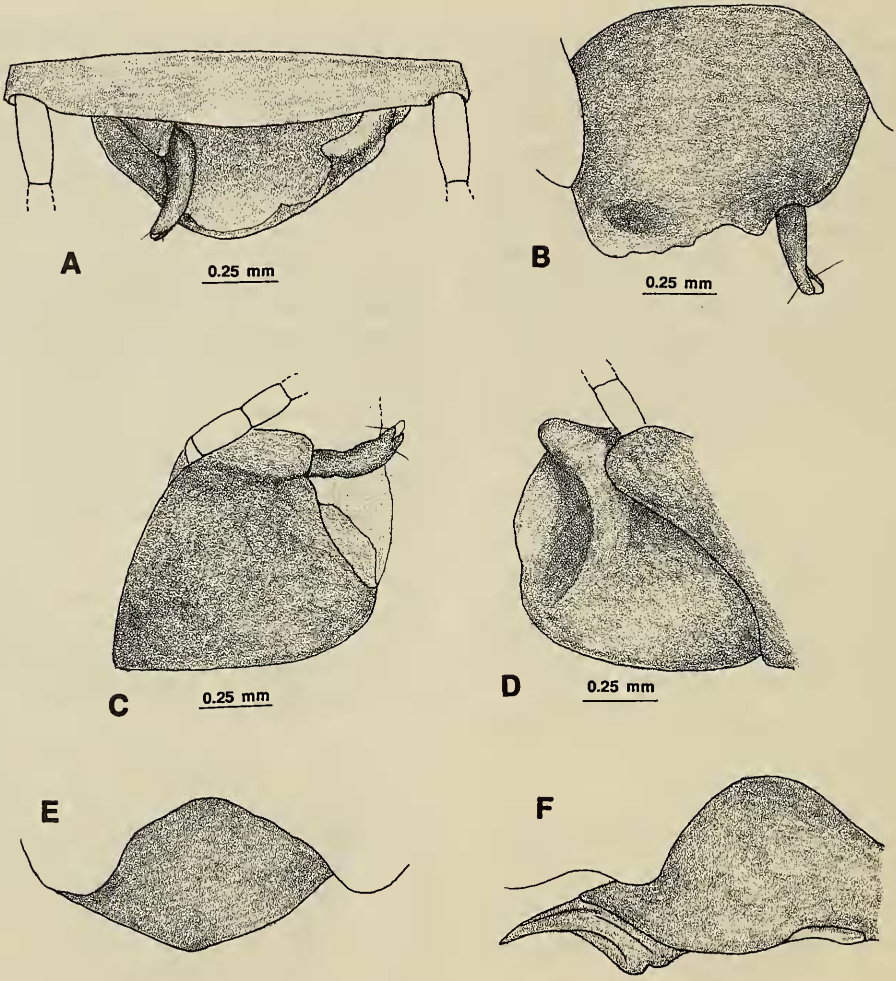


Fig. 21. *Ctenoneura* spp. – A-D, *C. crassistyla* sp. n., male holotype. A, supraanal and subgenital plates (dorsal); B. subgenital plate (ventral); C. subgenital plate (left lateral); D. subgenital plate (right lateral). – E, F. *C. simulans* Bey-Bienko; E. subgenital plate (ventral); F. subgenital plate (rear view) (redrawn from Bey-Bienko, 1969).

cubitus vein with six branches, the first one from the wing base bifurcate. Subgenital plate when viewed from below as in fig. 21E; when viewed from behind it has an irregular appendage on the right (fig. 21F). Cerci moderately long, fourth to sixth segments oval, tip of apical segment blunt, rounded.

Colour. – Brownish yellow. Head dark chestnut. Pronotum chestnut brown with broad, hyaline lateral parts. Wings just perceptably infuscated.

Female. Unknown.

Measurements (mm). – Body length, 8.0; pronotum length x width, 2.2 x 3.0; tegmen length, 9.0; overall length, 11.5.

Comments. – According to Bey-Bienko, outwardly this species resembles *misera*, but is clearly distinguished from all known species in the genus by the structure of the subgenital plate. Bey-Bienko does not mention whether or not there is a style (which could be small on the dorsal surface of the plate, and not visible in ventral or rear views).

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